FLIGHT and AIRCRAFT ENGINEER

Editorial Director G. GEOFFREY SMITH, M.B.E.
Editor - - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams : Flightpres, Sedist, London. Telephone : Waterloo 3333 (60 lines.)

COVENTRY: 8 - 10, CORPORATION ST. Telegrams : Autocar, Coventry. Telephone : Coventry 5210.
BIRMINGHAM, 2: KING EDWARD HOUSE, NEW STREET. Telegrams : Autopress, Birmingham. Telephone : Midland 7191 (7 lines).
MANCHESTER, 3 : 260, DEANSGATE. Telegrams : Iliffe, Manchester Telephone: Blackfriars 4412 (3 lines) Deansgate 3595 (2 lines)
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams : Iliffe, Glasgow Telephone : Central 4857

SUBSCRIPTION RATES : Home and Abroad : Year, £3 1 0. 6 months, £1 10 6.

No. 2074. Vol. LIV September 23rd, 1948 Thursdays, One Shilling

The Outlook

Rearming Once More

NOTHING could be more tragic than the reflection that, during the very week when Great Britain was honouring the memory of those gallant R.A.F. boys who in 1940 stood between her and defeat at the hands of the Germans, it should have become necessary for the British Government to announce its decision to rearm. No one has yet suggested that war is inevitable, but it is wise to act on the assumption that it is, and to accept the human and financial burdens which rapid rearmament will entail.

So far as fighter aircraft and power plants are concerned, the country is not in a bad position. The Meteor and Vampire are already in service, and production of them can be speeded up. The Attacker and N.7/46 can be brought to the production stage fairly quickly. Mr. Herbert Morrison stated in the House of Commons on September 14th that measures are being adopted which will nearly double the present rate of output of certain fighters.

Less promising is the position when it comes to night fighters. Experience in the German war showed that two-seaters are essential, and in the recent Air Exercises no jet fighters were employed for night interception, nor has any announcement been made of any two-seaters coming along with the exception of trainers.

Stanley Baldwin once delivered the dictum that "Our Frontier is the Rhine." It is important to bear in mind that in a war with Russia our advanced bases would be in Western Germany, and that the nations of the Western Union would be entirely dependent upon Great Britain and the United States for armament of all sorts, notably aircraft. That fact affects not only air strategy but the demands upon our production capacity. The ultimate defence organization may take the form of national air forces of the continental nations being supplemented and strengthened by considerable contingents from Great Britain and America.

Such a set-up would help to relieve the anxiety felt, which we have expressed more than once, about the British bomber position. America is ahead of us in heavy bomber production, both jet propelled and piston-engined versions having reached an advanced stage of development.

The decision to develop jet-propelled bombers was announced some three and a half years ago when the Air Ministry issued a specification for a medium-range, twin-jet bomber, "capable of a speed approximately twice that of the current reciprocating-engined bomber." This would mean a speed in the 600 m.p.h. neighbourhood; but evidently the range was afterwards considered inadequate, and about two years ago an order was placed for a heavy bomber of longer range and powered by four turbo-jet power plants. Even this, after a time, did not satisfy the Air Staff, and last year it was announced that still further improvements in speed, range and operating height were being demanded.

It is very commendable to hitch one's wagon to a star, but in this instance the aim may have been set too high, and too much reliance seems to have been placed on the likelihood that a period of peace would justify long-term planning.

The Personnel Position

AS for manning, it should not be too difficult to find the men to crew a re-expanded air fleet if an emergency arose, for a very large proportion of the pilots in uniform in 1945 can still be regarded as useful aircrew material. Conditions and techniques have not altered appreciably in the last three years. There is, however, an immediate requirement for crews to prevent the regular nucleus upon which we should build in emergency from remaining at its present dangerously low level. It is essential that more young volunteers should be attracted to the R.A.F. for regular service and training to handle high-speed aircraft, particularly jet fighters.

In addition to the volunteers, many of the younger

"old hands" are needed back in uniform, and, in fact, are anxious to return. The new offer to ex-crew men of eight years' service plus four on the reserve and with "further career prospects" will, therefore, be welcome. Details are given on page 389. The raising of the age limit will in no way reduce physical standards or impair efficiency, but should, on the contrary, result in the reharnessing of a great deal of invaluable experience which had been lost to the Air Force. The increased period of national service will have little effect on the squadrons, the fifteen months now planned being still too short a time to justify training in crew duties.

CONTENTS

Outlook	363
Lincolns Over London	365
Here and There	367
Civil Aviation News	369
S.B.A.C. Souvenirs	373
Ultra Lights	378
Carrier-Borne Bomber	380
Aircrew Selection	381
Nimonic Alloys	383
Tie-Rod Transmission	386
Correspondence	387
Service Aviation	388

Forthcoming Events, page 385

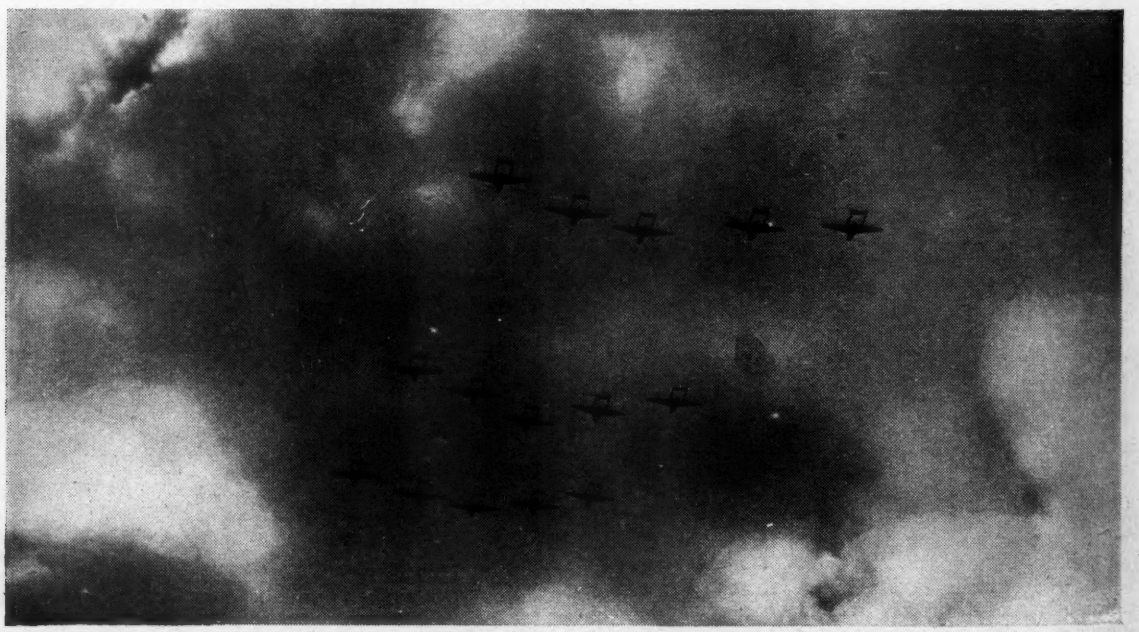
The Fly-Past—A Missed Opportunity

THIS country is fortunate in having a number of first-line military aircraft types which, although still numerically inadequate for our needs, are second to none in quality and efficiency. The general public have been told this often enough, and as always they have the greatest confidence in the ability of the Royal Air Force to operate them. In 1940, when we were desperately short of fighter aircraft, the men of Fighter Command—"The Few"—by almost superhuman effort successfully defended their country in the air.

On Wednesday, September 15th, this great air victory was again commemorated by a fly-past. This annual event has come to be regarded as a spectacle designed not only to honour the memory of the Battle of Britain heroes but to serve as a token demonstration of the country's might in the air. Talk of rearmament, recruitment and civil defence, and the dearth of good news from abroad, has engendered a mood of frustration which a really first-class fly-past could have done much to relieve. And the people were undoubtedly looking forward to seeing mass formations of R.A.F. jet fighters sweeping over the capital in company with Naval squadrons, and with fighters and bombers of the U.S.A.F. But somehow that is not what happened. The fly-past, delayed by five hours, fell flat, and, as Londoners hurried for their trains and buses, an occasional deep or high-pitched hum, and perhaps a fleeting glimpse of an aircraft, was all they knew of the great commemorative fly-past.

To say that it is a pity that such a great occasion to boost morale was missed is an understatement, and the whole procedure must have been as unsatisfactory to the participating squadrons as it was to those who watched them. Undoubtedly there are considerable difficulties in organizing a great air spectacle of this sort, and to the inclement weather which frequently dogs Battle of Britain Day has now to be added the increasing disparity of speeds between bombers and jet fighters.

There is no room for half-measures on these occasions, and no amount of individual effort by the crews can make up for lack of thorough organization and preparation. Fortunately most people know that a trickle of formations, many of them rather ragged, and spaced at long intervals, is in no way representative of British all-weather air might on parade. But another year let us make certain our own confidence in this country's air defences is strengthened by the fly-past, and that those who would like to think and report otherwise are left without any doubt that the Lion has sharp, new claws.



IN THE LEAD: The fifteen de Havilland Vampire jet fighters, which led the Battle of Britain Fly-Past ride the bumps over London in excellent formation. That all formations were not of the same quality is regrettable, but some of the difficulties encountered in the air are related on pages 365 and 366.

LINCOLNS OVER LONDON

One Man's View of the Battle of Britain Fly-past

ROYAL Air Force Station Wyton (Station Commander G/C. N. C. Odbert, O.B.E.) was a war-famous Mosquito base, but is now inhabited by Lincoln squadrons of No. 3 Group, the unit numbers of which must remain unstated. To Wyton it was that the writer reported on the night of September 14th to participate, as passenger in an Avro Lincoln, in the Battle of Britain commemorative fly-past, an overall appreciation (or, more strictly, depreciation) of which, written by an observer on a London roof, appears as a leader in this issue.

Late as the hour was, the Wing Commander Flying (W/C. E. H. Thompson, D.F.C.) drove us out to his office to study the "Form B," which stated very precisely what was demanded of the Wyton formations on the following day. ("Form B" is a teleprinted operational order from Group headquarters to units, "Form A" being a corresponding order from Command to Group). Wyton was to supply six Lincolns, drawn from two squadrons, which were to join formation with a similar force from Binbrook, a 1-Group airfield farther north. Coastal and Training Command Lancasters, with Transport Command Halifaxes, would bring up the rear. Ahead would be the Naval Sea Hornets and Firebrands, the Mosquito formations, and fighters of the R.A.F., R.Aux.A.F. and U.S.A.F.

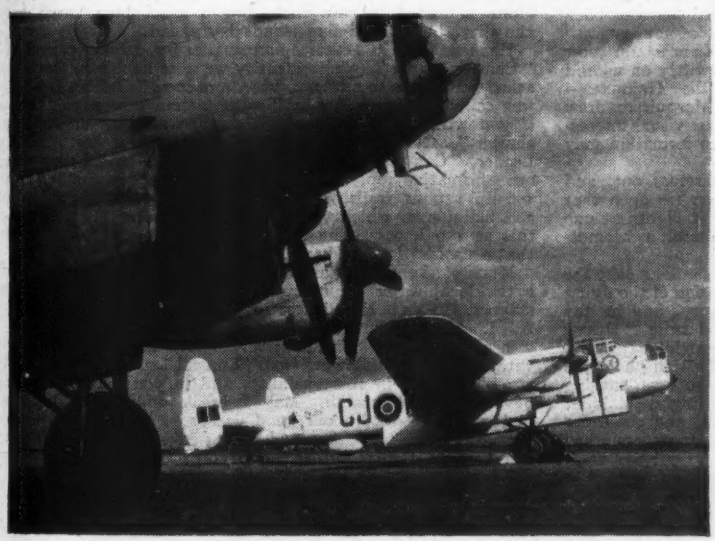
The route lay over Great Yarmouth, Southend, Hornchurch, Trafalgar Square, Chiswick, Sutton, Bromley, Woolwich, Ilford, Edmonton, Barnet, Watford, High Wycombe, Coventry, Birmingham, Wolverhampton, Stoke, Manchester, Bradford, Leeds, Sheffield, Derby, Leicester and Peterborough; so if things went well (which in the event they did not), large areas of England would see a sizeable force of R.A.F. "heavies." Form B further laid down the speed and height (145 knots indicated, 2,000ft), defined the bad-weather route, and stated other requirements which would be irrelevant in the present narrative.

The Lincoln formations from Binbrook and Wyton on their run-up to "Zero" Line (Charing Cross Road—Trafalgar Sq.—Whitehall).

Six Coastal Lancasters—three from St. Eval and three from Leuchars—were already at Wyton, and the Training Command and Transport Command formations were to append themselves to the Lincoln force when over Yarmouth. Time over Southend was 1300½ hours, and over Trafalgar Square, 1314 hours.

Met. briefing next morning, by a Polish officer, with the Group Captain present, was discouraging, with frequent reference to cold fronts and similarly uncongenial phenomena. There was little surprise (though some imaginative swearing) when, after we had drawn parachutes and introduced ourselves to F/L. N. J. Bull, our pilot, word came that the fly-past had been "scrubbed." There was hope, however, for the afternoon.

The delay necessitated a fresh briefing, the import of which was take-off at 1545 hours, joining with the Binbrook Lincolns at 1615, set course 1625, Trafalgar Square 1744 (H hour + 44 min). This left us time to examine the visiting Coastal "Lancs," some painted white with red spinners, others camouflaged in a nondescript scheme of green and blue. Squadron Leader Cribb, D.S.O., D.F.C., leader of the St. Eval detachment, pointed out the windows forward of the tail for



In an isolated burst of sunshine a Coastal Command Lancaster waits at Wyton for the afternoon fly-past.

"Flight" photograph.

Lincolns Over London . . . . .

"met." observation, and the Lindholme rescue gear in one of the bomb bays. Pending the arrival of Shackletons these stalwart ex-bombers are doing splendid work.

Before ascending to the forward interior of Lincoln LSB-"Baker" we noticed the bulged bomb-bay doors and special bomb slips for a 12,000-lb "Tallboy," and the turretless nose, housing something extra-special in the way of bomb-sights. Comment on these features drew from F/L. Bull the information that he had been engaged on Project Ruby—the experimental bombing of the Farge U-Boat pens.

Once we had installed ourselves in the cockpit behind the flight engineer it was a matter of a few minutes before our Skipper reported "B-Baker rolling" to Control, and the other Lincolns and Lancasters, stacked tightly behind at the head of the runway, receded swiftly as the Merlin 68As were progressively opened up to full power. Clear of the airfield F/L. Bull ordered gradually reduced output—"2,850+9," "2,650 +7," and finally a modest 2,200 revs. At this r.p.m. the other Lincolns quickly closed on us, and our mid-upper gunner was soon asking the skipper to tell D-"Dog" that his door was open. By the time it had been explained that *Flight's* photographer was flying in "Dog," the whole Wyton formation was complete. One of the Coastal Command flights now called up to ask if, as only two of its Lancasters had managed to get airborne, these could go into line astern; another voice thought this was a good idea. Someone else gave warning to look out for Superforts; and soon "Heavy Leader" (leader of the Binbrook formation, which we were soon to join) notified us that he was at Angels 1.3, upon which F/L. Bull declared his intention of descending to Angels 1.5.

The Binbrook Lincolns suddenly came bearing down on us from starboard, and we turned, opening up to 160 knots, to overhaul them as they drew away. Closing in from astern we quickly felt their slipstreams and saw the twin cannon in their mid-upper turrets variously traversed and elevated. On course for Great Yarmouth—now in open order—we could see Lakenheath, with its groups of parked Superfortresses. "Halifax Leader" now reported his position as eight miles south-west of Cambridge, height 2,000ft; the Training Command Lancasters asked "Heavy Leader" "Do you read?" (to which, even after repetition, there came no reply); a Canadian voice politely requested a course, and someone remarked (not, we think in this connection) that there was one born every minute.

Rendezvous at Yarmouth

By 1746 hrs Yarmouth was below, and here we turned port over the bird-swarming sandbank off-shore, losing height in a manner which caused "No. 3" of the flight ahead to break formation and veer away as we orbited the town. He returned gingerly after a few minutes and edged his way back into position. Without warning a formation of four-engined aircraft (possibly the Training Command Lancasters) now materialized out of the murk to port, closed swiftly on us and passed close above. A second—possibly the Halifaxes—clipped across our bows, and miscellaneous Mosquitoes drew in from various points. (Such, at least, was our visual impression; in fact, we have an idea that a Mosquito formation may have broken up on our account).

The newly-met forces seemed to sort themselves out, and once on course for Southend in open formation (so open that the inter-mingling of the Binbrook and Wyton flights at one time appeared imminent) the skipper allowed himself a thermos-thimble of tea.

From now on the name "Kinder" became familiar over the R/T. We later gathered that this was the call sign of the flying Training Command Lancasters, from Shawbury, and as the result of requests from "Kinder" we learned from "Heavy Leader" that our position was twelve miles north of Ipswich, height 1,100ft, E.T.A. Southend 1730 hrs. Ipswich passed to port at 1717, as F/L. Bull asked for another 50 revs, causing E.2 Simmonds to adjust the pitch levers accordingly. Maldon, Essex, drifted by the cockpit window at 1727, and the order now came to close formation. The flight engineer remarked that things looked grim over London, which no one disputed. All the way from base visibility had been murky to poor.

When Southend should have been more-or-less below (we must confess that, peer as we might, we never did see it) a Hurricane—doubtless *the* Hurricane—passed us to port and was soon lost in the gloom ahead.

"*Flight*" *photograph.*

After briefing at Wyton, G/C. Odbert, W/C. Thompson and F/L. Bull (centre), note that the planned route lies by way of Derby, home of the Merlins used in their Lincolns.

By 1734, with ten minutes to the zero line, our formation was tight and orderly, despite stronger and more frequent bumps. One of our crew spotted a favourite pub. As he recalled the happy cans he had emptied there in his time sun rays came slanting through the clouds ahead, gilding the gasometers and flooding Dockland in a pool of light. The old river closed in from port and as we fell to meditating on Britain's seaborne commerce, the Royal Navy, in the form of Sea Hornets and Firebrands, emerged from the grimy haze astern and forged ahead with a good hundred knots in hand. Suddenly there came a flash of sunlight so dazzling that it was impossible to make out the Lincoln directly ahead. A patch of blue—the same blue in which decisive battles were fought out eight years ago that day—was briefly visible, and the battered City round St. Paul's lay before us in mellow autumn sunshine. Momentarily the sun caught silver wings far ahead, and a woman's song came faintly over the R/T.

Between Tower Bridge and Dorset House, at 2,000ft, someone complained that he had only "115 on the clock"; such are the difficulties in handling formations of large, relatively slow aircraft to rigid time limits, with poor visibility, bumps, and slipstream interference as confounding factors.

Remarkably enough, visibility over central London itself was so good that landmarks stood out clearly. Especially noticeable was the white-painted Lancaster in the park near Marble Arch. Some of our crew were able to spot the Meteor, Vampire, Spitfire and Hurricane on the Horse Guards Parade. Near Chiswick, as we turned south, a red-tailed Swissair Dakota slipped close below on course for London Airport, and circling, we were able for the first time to see the stream of Lancasters and Halifaxes astern. Coming up from the south once more we crossed the river near Millwall at 160 knots indicated. Again there was a small blue patch over the City, but threatening clouds lay ahead.

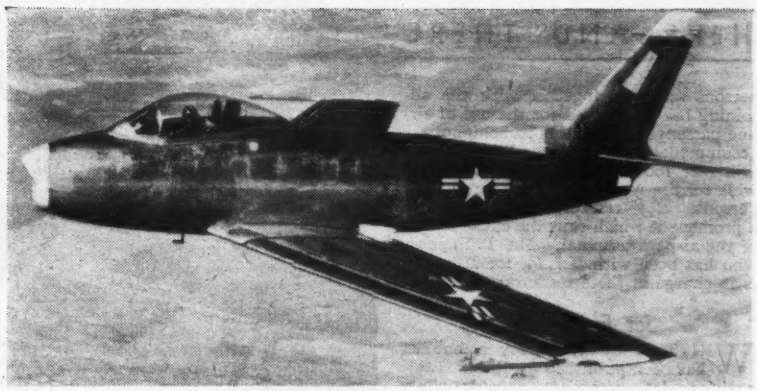
Hendon, with its Dakotas and smaller fry, having passed by, "Chester Leader" (whose identity we were unable to establish) asked permission to return to base, and soon "Halifax Leader" was calling "Heavy Leader" with a similar request. "Yes, if you wish," was the reply, "we are pressing on to Manchester." Our own aircraft was now asked by "Heavy Leader, "Can you see me in this visibility?" and scarcely had our affirmative reply been made when our Lincoln began to set up vapour trails, from wing tips and other portions of the mainplane, which would not have shamed John Derry—this at 150 knots. The flight engineer thought momentarily that a coolant leak had developed.

Much of the windscreen was now spattered with insects, and a trickle of water crept across the cockpit floor. Mused the skipper, "This is the slickest 145 knots I've ever done." The A.S.I. showed 160.

That conditions generally were really becoming trying is witnessed by the following from "Coastal Leader": "With the strain of flying in this visibility, and in your slipstream, my boys have had enough. May I break off?" So the Lancasters departed with our good wishes. Our remaining force now tightened formation and increased speed to 170 knots, but soon "Wyton Leader"—our own Skipper—was calling "Heavy Leader" to tell him that we intended to break formation after Coventry. As things turned out, this was unnecessary, for the order "Cancel exercise" soon came. A green Verey light soared up from "Heavy Leader" and we flew

(*Continued on page* 386.)

HERE AND THERE



FASTEST FIGHTER: As recorded on this page, a North American F-86 jet fighter has established—subject to F.A.I. confirmation—a new world's speed record of 670.981 m.p.h. The F-86 is in full quantity production for the U.S. Air Force.

Mamba Fuel Consumption

IT is learned that the specific consumption of the Mamba has been improved as a result of development work, and that at the maximum continuous cruising rating, engine speed 14,000 r.p.m., the figure is now 0.785 lb/b.h.p./hr, or, taking into consideration the 330 lb residual thrust, 0.716 lb/equiv. s.h.p./hr.

Mach-Meter Reading

ATTAINMENT of Mach 1.04 is mentioned by Kelvin-Kollsman, makers of the Mach-meter fitted to the D.H. 108 during its recent supersonic flight reported in *Flight*, September 16th. This represents a speed of approximately 700 m.p.h. at a height range of 30,000-40,000 ft. The D.H. 108 also carried Kelvin-Kollsman sensitive altimeter and A.S.I.

Speed Record Broken

FOLLOWING recent attempts on the world's speed record which were not satisfactorily recorded by the timing apparatus, Maj. R. Johnson has now been successful in setting up a new record. Flying a normally armed and equipped F-86 fighter, a photograph of which appears on this page, Maj. Johnson's average speed of four runs was 670.981 m.p.h.

New Americans

THE following American military aircraft are announced: McDonnell XF-88 "penetration" twin-jet fighter; Northrop XF-89 twin-jet all-weather fighter; Lockheed XF-90 supersonic twin-jet fighter with auxiliary rockets; Republic XF-91 and Convair XF-92 supersonic jet-plus-rocket interceptors; Boeing XB-52 heavy bomber with turboprops. The Northrop X-4 is a new research aircraft.

Recognition Society Meeting

GEOFFREY DORMAN, A.R.Ae.S., was the guest speaker at the opening meeting, for the winter season, of the Aircraft Recognition Society held in the library of the R.Ae.S. on September 15th. His subject was early aircraft and 30 slides of aircraft of the 1908-14 period illustrated the lecture. The first of these was of Mr. J. T. C. Moore-Brabazon (now Lord Brabazon) flying a Voisin biplane in France in 1908; this picture was published as the frontispiece of the first issue of *Flight* in January, 1909.

Apprentice Scholarship Award

ONE of the university scholarships awarded by the S.B.A.C. to outstanding apprentices in the aircraft industry has been won by A. H. Eldridge, of Woodford, Manchester. This scholarship, valued at £250 p.a., is tenable for two years at the College of Aeronautics. During the war Eldridge worked for A. V. Roe, Ltd., on Lancasters at Woodford, and has served in most of the departments of the Woodford and Chadderton factories. He is now in the Aerodynamics department, Chadderton.

Mr. A. H. Eldridge.

Export Orders Follow S.B.A.C. Show

DURING the S.B.A.C. display at Farnborough three companies announced that orders, some for export, had been obtained for their aircraft. They are: Percivals, who are to supply Prentice trainers to the Argentine, and de Havillands, who have received a third substantial order for Vampires for Sweden. As announced in *Flight*, September 16th, B.S.A.A. have placed an order for three Short Sealands for the use of British West Indian Airways in the Caribbean.

Fairey Celebration

TO mark the completion of the thousandth Fairey Firefly this machine was demonstrated over the company's Hayes factory at noon on September 20th and each employee was given a free glass of beer by the management.

Shell-Mex Appointments

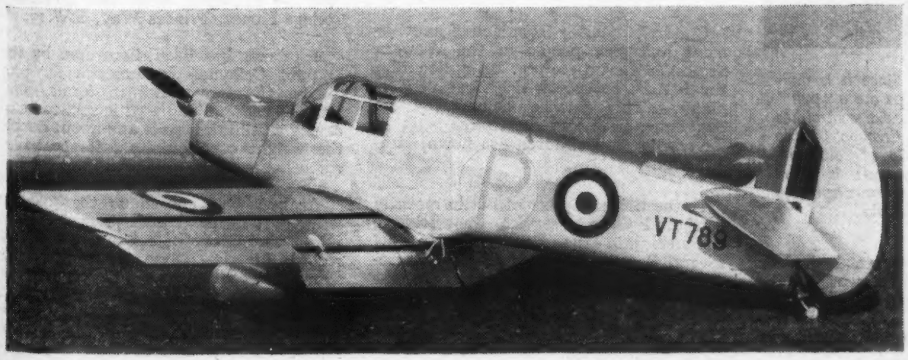
MR. CECIL FIELD aviation manager of Shell-Mex and B.P., Ltd., has been appointed general sales manager of the company from October 1st. He is being succeeded as aviation manager by Mr. J. C. C. Taylor.

R.Ae.S. Examinations

ENTRIES for the next Associate Fellowship Examination of the Royal Aeronautical Society, which will be held in the middle of December, 1948, should reach the Secretary by September 30th. A new syllabus comes into force on January 1st, 1949.

Refreshments at Schiphol

WHAT is claimed to be the largest airport restaurant in Europe has been completed at Schiphol, Amsterdam, the home base of K.L.M. On the first floor, seating accommodation is for 250



HALF CHORD AND FULL SPAN: Delivered to the R.A.E. earlier in the year, this Youngman-Baynes high-lift research machine was built for the M.O.S. by the Heston Aircraft Company. Its power-operated, full-span slotted main flaps with semi-span rear flaps are the work of Mr. L. E. Baynes. The engine is a Gipsy Queen 32, and the Percival-like appearance forward results from the use of Proctor screens and door. Two seats are provided.

HERE AND THERE

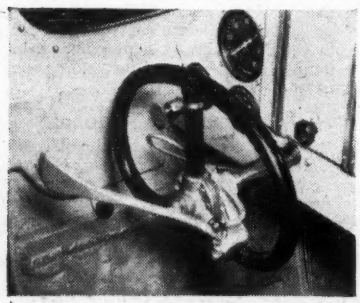
persons and this together with the adjoining bar is reserved for the use of airline passengers. Visitors to Schiphol are accommodated on the second floor, which will seat 100 persons and opens on to a wide terrace with room for a further 100 persons. Both restaurants have access to a promenade which runs the entire length of the airport terminal. Mr. T. Simons, who has been with K.L.M. for 26 years, is in charge of these restaurant facilities.

Jet Electrics

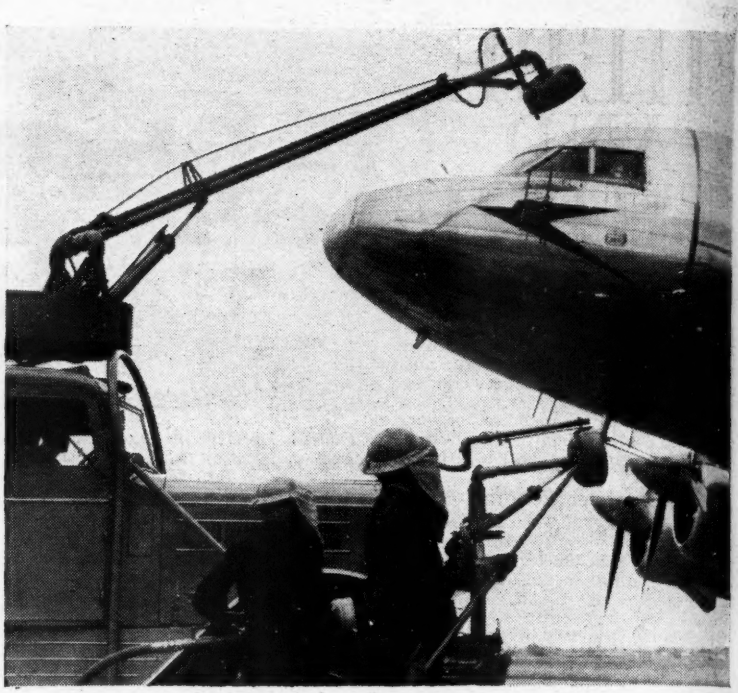
WRITTEN by J. Furzey a booklet has been published by Rotax, Ltd., entitled *Jet Electrics*; this brochure reviews some of the electrical problems associated with the starting of aircraft gas turbines. As an introduction, the various principles on which gas turbines operate—both airscrew turbines and turbo-jets are dealt with—are explained with commendable clarity and an absence of highly technical language which will be appreciated by non-specialist readers. The writer then turns to the starting problems and explains the various requirements demanded of both fuel and ignition systems. After thus laying a sound foundation the aspects of gas turbine starting as viewed by the electrical rather than the mechanical engineer are dealt with. Illustrations and diagrams, many of which are coloured, complete an excellently produced publication.

R.T.O. at Fairey's Retires

AFTER holding the appointment of Resident Technical Officer at the Hayes factory of Fairey's for nine years Captain H. G. Harrison is retiring. Capt. Harrison's engineering career began in 1905 with Legros and Knowles. In 1914 he joined Short Brothers, where he met Sir Richard Fairey for the first time. For three years during the 1914-18 war he served with the R.N.A.S. and the R.A.F., after which he joined the Air Ministry. Capt. Harrison was at the R.A.E. for sixteen years and in 1939 went to Fairey's as R.T.O. He is succeeded by Mr. S. O. Norman, previously R.T.O. at Short Brothers.



FOR LEGLESS PILOTS: Since it is difficult for legless pilots to operate a "pull" action handbrake this special control has been designed for the Ercoupe by the Grand Central Airport Co. of California. The Ercoupe private aircraft is fitted with a "two-control" system dispensing with rudder pedals.



M.C.A. FIREFIGHTERS: The Fire and Rescue Service at London Airport is here seen practising with the first Cardox firefighting vehicle for use on a British airport. Built by an American firm this vehicle carries 6,000lb of liquid carbon-dioxide which can be discharged through twelve nozzles in one and a half minutes. The main boom on top of the cab and the front applicator are operated by hydraulics controlled from inside the cab. The all-up weight of the vehicle is 17 tons.

Applied Mechanics Congress Ends

THE Seventh International Congress of Applied Mechanics which opened at the Imperial College of Science and Technology, South Kensington, on September 5th, as reported in *Flight*, September 9th, was concluded with the Congress Banquet, attended by over 500 guests, on September 10th. More than 200 papers were read during the Congress, a large number of these being on subjects of aeronautical interest. It is hoped to publish the proceedings in due course, though these may not be available until next year.

Jet Targets in U.S.

EIGHTEEN aircraft manufacturers and other contractors in the U.S. were invited to tender for an order for pilotless jet aircraft for use as targets by the U.S. Navy and Air Force for anti-aircraft and air gunnery practice. Of the 14 designs submitted the quotation put in by the Ryan Aeronautical Co. was selected, no technical details have been announced, though the size of the target aircraft is said to be less than half the size of the average fighter. The specification designates this pilotless machine the XQ-2.

News in Brief

More than 2,000 officers and men of the U.S.A.F. (59th Air Group) arrived at Liverpool on their way to Burtonwood on September 13th. A number of them had served there during the war.

* * *

Children suffering from lack of nourishment and sick people in the Western Sectors of Berlin are now being flown by the R.A.F. to the British Zone of Germany. This service commenced on September 20th and the charge is £1 4s for adults, and children are flown without charge.

* * *

In the British Sector of Berlin recently a special church service was held to commemorate the Battle of Britain; several Germans were among the congregation. A plaque to the memory of the victims of the Viking-Yak collision over Gatow last April was unveiled by Brig. E. F. Benson, deputy Commandant of the British Sector.

A dance for past and present students of the Colleges of Automobile and Aeronautical Engineering is to be held at the Victoria Hall, Bloomsbury Square, W.C.1, on Friday, October 15th. Tickets may be obtained from the Secretary, College House, Princes Way, S.W.19.

* * *

A process has been discovered by the Dupont Company in America for producing titanium metal in forms other than powder. The metal is said to be as strong as stainless steel and about double the weight of aluminium; its heat and corrosion resisting properties are good.

* * *

Arnhem was chosen as the town in which the formal Dutch premiere of the film "The Glory of Sport," which is a record of the Olympic Games, was shown. The film was produced by Mr. Castleton Knight who was in Arnhem in 1946 producing the film "Theirs is the Glory" recording the exploits of the British Airborne Forces there

CIVIL AVIATION NEWS

"Flight" photograph.

AIRLINER ADVANCED TRAINER: In addition to its important role as a charter and private owner aircraft the Dove has filled a gap as a trainer for large civil airliners. Including Devons for the R.A.F., which differ only in items of equipment, 187 of the type are now in service in various parts of the world.

Sir Frank Whittle's Paper to I.A.T.A. Conference : Charter Companies' Air Lift : First Year of Aviation in India

I.A.T.A. CONDEMNS TRAFFIC CONTROL METHODS

DELEGATES to the I.A.T.A. General Meeting in Brussels considered that airline expenses would be reduced enormously by an adequate system of air traffic control and navigational aids at airports. The Association's technical committee had estimated that delays due to the lack of proper facilities for handling traffic during bad weather had cost United States air lines alone more than £7 million. At one Continental airport the cost of one hour of "instrument" weather was computed to be £100, and 1,200 hours had been experienced over twelve months. The technical committee report proposed that a special panel of airline experts should be set up to undertake what it called "the major task and co-ordination on an international basis of the all-weather air traffic control problem." The committee's next meeting will take place in May, 1949.

The assembly was also told that the I.A.T.A. Clearing House in London would handle more than £25 million-worth of inter-airline transactions during 1948, and a forecast for 1949 was in excess of £35 million, all of which, by special arrangement between governments, would be settled in both dollars and sterling. Mr. A. J. Quin-Harkin, manager of the Clearing House, announced that 30 members had joined the organization, and he predicted that by 1952 it would be handling an annual turnover of £65 million. Members were saving almost £7½ million a year in brokerage payments alone. It had also covered members against more than £30 million of losses in the devaluation of the French franc, he said, and it would protect them from the recent appreciation of the New Zealand pound.

In the course of two reports, the traffic committee announced that the traffic conferences would meet in Bermuda on November 9th, to deal with questions of rates, tariffs and conditions of carriage, and agency administration. The basic terms on which carriers accept passengers and freight were reported to be in the process of amendment for the benefit of the travelling public. Whereas the new conditions did not mean that carriers were expected to meet unsupported claims for losses, the traffic committee were of the opinion that the airlines should deal more reasonably with the public. Observing that I.A.T.A. members had occasionally been faced with fare competition from some airlines which were not members of the conference, the traffic committee suggested that the question of unfair competition should be dealt with by governments.

Dr. Albert Plesman, founder and president of K.L.M., was elected president of I.A.T.A., to take office at the 1949 assembly at The Hague.

SABENA ANNIVERSARY

IN commemoration of their first cross-Channel service in 1923, a special flight was made by Sabena from Ostend to Lympne on Friday, September 17th. The passengers included Albert Van Cothem, who flew the first cross-Channel schedule in D.H.9 OO-BIEN, powered by an Armstrong-Siddeley 200 h.p. Puma. On that occasion he flew a navigator and one passenger, but the aircraft was later converted to carry two passengers. Mr. Van Cothem is no longer connected with aviation professionally, but at 59 makes a point of flying his Auster Arrow every day. Other visitors included Col. Baron Frederic de Woelmont, president of the National Civil Aeronautical Association of Belgium; Mr. P. Goddard, director of the Belgian Ministry of Transport; Mr. S. Van den Borre, director of the Belgian Ministry of Education, and Mr. L. Pineax, of the Belgian Post Office.

WEATHER SHIPS

BY June, 1949, the North Atlantic ocean weather station system should be completed. Eight out of the total thirteen stations are at present maintained by nations bordering the North Atlantic, and the United States Government has notified I.C.A.O. that the remaining five stations will be put into operation during the next nine months. It will be remembered that the system was recommended by the North Atlantic Regional Air Navigation meeting in Dublin. It was a United States weather ship which rescued 69 passengers and crew from the *Bermuda Sky Queen* flying-boat, which ran out of fuel and alighted in the Atlantic about a year ago.

B.E.A. TRAMPS

ON return journeys to Northolt two of British European Airways' freighters will fly as tramps during the coming winter. Agents and shippers will be able to deal with any consignment of goods from the Continent which could not be carried in the holds on normal Viking passenger services. This arrangement applies particularly to the London/Hamburg via Amsterdam and Copenhagen service and the London/Athens via Marseilles and Rome service. The

Civil Aviation News . . .

former operates outward daily schedules except on Saturdays and Sundays, and the latter operates three times a week.

Tramping in this case means that the freighter will not fly to a fixed schedule but according to traffic demands within a given period, before returning to base in the U.K.

By the end of this month the Corporation will be flying nine 28-seater Dakotas on the Channel Island routes, and between the 5th and 21st October five more are due to be completed and will be put into service on the London/Belfast, London/Glasgow, Belfast/Glasgow and Glasgow/Isle of Man services. The additional seven seats have been obtained by placing four in each of the seven rows with a central aisle, instead of one seat on the port side and two on the starboard side with an offset aisle as in the 21-seater.

"Flight" photograph.

PRACTICAL AND EFFICIENT: After unfortunate setbacks in the past, it is hoped that now Handley Page (Reading) Ltd. are responsible for production, the Marathon will soon be seen on British services. The 20-22-seater has a payload of 1½ tons over nearly 1,000 miles.

PILOTS CONFERENCE AT PARIS

THE second conference of the International Federation of Air Line Pilots' Associations held under the auspices of the *Syndicat National des Officiers de l'Aviation Marchande*, the French Pilots' Association, began in Paris on September 20th and was due to end this morning. At its first meeting in London in April representatives from 16 nations were present and the International Federation was formed, since when 13 organizations have ratified the Memorandum of Agreement of Federation and are now formal members. These include pilots' associations of the following nations: Australia, Belgium, Canada, Denmark, Holland, France, Ireland, New Zealand, Norway, Switzerland, Central Africa, U.S.A. and U.K.

At the Paris conference the main items considered were the constitution of the Federation and various aspects of air traffic control, air safety, seniority, aircraft airworthiness standards, airport markings and lighting, airway and navigational aids, service agreements and pilots' working conditions.

British representatives at the conference were Capt. A. P. W. Cane and Capt. M. L. H. Carter, chairman and vice-chairman respectively of B.A.L.P.A. and Capt. F. Ormonroyd.

I.A.T.A. HEARS ABOUT TURBINE FUTURE

SIR FRANK WHITTLE told members of the International Air Transport Association in a paper read at Brussels on September 15th that turboprop engines would be ready for civil airline use within five years. He agreed that air traffic handling limitations prevented the use of turbojets even sooner. He made a forecast, however, that gas turbine power plants would give civil transport greater safety, speed and comfort at reduced capital and operating costs. He advised airline companies to prepare to operate with propeller gas turbines almost at once and to prepare to operate jet aircraft when technical improvement and international action in the field of aircraft traffic control had removed the necessity for "stacking." Whereas turboprop aircraft could cruise around at low speeds and save fuel by shutting down some engines, the jet aircraft would not gain anything by such a technique.

Sir Frank said that manufacturing costs of gas turbines were a good deal higher than they need be, because of the small number of units now in production and also because manufacturing techniques were in the process of evolution. He had no doubt, he said, that ultimately the cost per horsepower in quantity production would be very much less than half that of a reciprocating engine. Turboprops would take longer to develop than turbojets, and engines with axial flow compressors would take longer to develop than those with centrifugal flow compressors but, as he pointed out, the piston engine had been developed over 40 years, whereas the gas turbine was in its infancy, and it should not take anything like as long to develop. It was possible, he said, to derive a whole family of gas turbines of varying powers by scaling up or down from one already in existence. In dealing with the advantages, he said all gas turbines had lower specific weight, small bulk and frontal area, complete absence of vibration and the ability to run on low grade fuel which reduced risk, first cost and maintenance. In addition to giving reliability there were other inherent advantages. The turbojet without either propeller or reduction gear was even lighter, more simple and smaller, produced no slipstream effect in flight; had simple engine controls; was easier to start, and cooling arrangements were not necessary. The turboprop was more immediately adaptable to airline needs under existing traffic conditions because its progressive efficiency was not seriously affected by reduced speeds, but he explained that turbojets did not match the efficiency of reciprocating engines at low altitudes and at low speeds. At speeds above 600 m.p.h., however, the overall efficiency was higher than could be obtained by any other known means. Fuel consumption of gas turbines would be cut down as designers concentrated on the problem under cruising conditions instead of on test-bed results and by further improvements in materials and the efficiency of engine components.

Sir Frank revealed that a lot of pressure was being brought to bear to use petrol because of its greater availability, but in his view the increase in safety that came with the use of kerosene due to reduced fire hazard was sufficient to over-ride every other consideration, especially since the quantities needed would be relatively small compared with military requirements. He pointed out that gas turbines could be run on various grades of petrol, kerosene or heavier fuels. In conclusion Sir Frank outlined the characteristics of four turbojet engines and seven turboprop engines in use or under development in Britain, as well as those of three turbojet and five turboprop civil aircraft in various stages of construction or flight testing.

AIRFIELD LIGHTING INVESTIGATION

IMPROVEMENT in approach and runway lighting at international airfields in Europe formed the subject of detailed investigation at the International Civil Aviation Organization meeting held in London on September 15th. The meeting, which was of an informal character, was called at the request of international airlines operating in that area, who believe that such measures, particularly in the North Atlantic and European regions, will make for greater regularity in services, especially during the winter months. European nations, already embarked on a large-scale programme for improving air navigation and airport facilities to meet the needs of post-war international aviation, have agreed to concentrate on the problem of better airport lighting as part of their plans. The Ministry of Civil Aviation are understood to be planning demonstrations of the various types of airfield lighting, the first of which was staged before delegates of the I.C.A.O. conference at the R.A.E., Farnborough, on September 14th.

BERLIN OPERATIONS

NEGOTIATIONS have now been completed by British European Airways Charter Section for a number of extra aircraft to join the civil side of the Berlin air lift. On September 10th the operational fleet was augmented by a Halifax from Bond Air Services and a Hythe belonging to Aquila Airways; on September 11th a Halifax owned by Skyflight, Ltd., went into operation, and was followed the next days by a Silver City Airways' Wayfarer, and the day after by a second S.C.A. Wayfarer and a further Bond Air Services' Halifax.

Since the civil side of the air lift started on August 5th, and despite bad weather and increasing maintenance difficulties, the aircraft have delivered nearly 100 tons of freight a day, in a daily average of 11 aircraft, on 30 flights. Traffic details of the three stations from which operations are being conducted are as follows: between August 5th and September 1st two Hythes, operating from Finkenwerder, completed 75 sorties,

carried approximately 340 tons, and flew 204 hours 53 minutes sortie hours; between August 12th and 18th an average of 10 Dakotas, operating from Fassberg, flew 165 sorties and carried over 1,000,000 lb of coal; and between September 4th and 10th the Tudor II chartered from Airflight, Ltd., lifted nearly 320,000 lb of freight with a minimum of two trips and a maximum of four trips a day. From August 12th to 18th two Halifaxes flew 11 sorties and carried nearly 160,000 lb, from August 23rd to 26th one Halifax flew seven sorties carrying over 95,000 lb, and from August 27th to September 2nd two Halifaxes flew 43 sorties, carrying nearly 300,000 lb. All these operations were conducted from Wunstorf, and the cargo consisted mainly of flour.

Since August 26th operations formerly carried out from Fassberg—Dakotas on the coal lift—have been organized from Lübeck. No traffic figures for either Lübeck or Fassberg have been available since August 18th.

SWISSAIR STATISTICS

SWISSAIR'S traffic totals for the first half of 1948 show a noticeable increase over those for the first half of 1947. The fact that the company operated only two inter-continental flights during the latter period must be taken into consideration. Between January 1st and June 30th this year the number of kilometres flown amounted to 2,957,016 against 1,626,896 during the same period of the previous year. The passenger kilometre total rose from 25,697,665 to 42,577,388, and 642,881 kgs of freight and 203,401 kgs of mail were carried against 408,738 and 168,389 kgs respectively during the first half of 1947. Scheduled as well as special flights have been included in the above figures.

AVIATION IN INDIA

A REVIEW of civil aviation in India between Independence Day and its first anniversary on August 15th this year shows that there has been considerable growth and expansion in air traffic and services both domestic and international. The first international air service, between Bombay and London, was opened during this period, and three other external services operating from Calcutta to Rangoon, Dacca and Chittagong were begun. Eighty-seven services are now operating on 27 routes, as again 27 services on 18 routes in 1947, of these 17 are daily and 70 weekly services. Eight transport undertakings, employing 167 aircraft, 234 pilots and over 168 other air crew personnel, have flown 4,858,893 miles, carrying 124,753 passengers and 2,573 tons of freight and mail during the period January-April, 1948. In addition to the existing 26 airfields, 14 more were opened for scheduled services at Amritsar, Benares Bikaner, Coimbatore, Cuttack, Deesa, (Palanpur), Palam (Delhi), Gauhati, Indore, Jaipur, Jubbulpore, Mandvi, Patna and Srinagar, and plans have been drawn up for the development of Santa Cruz, Dum Dum and Palam airports to international standards. Construction work is now proceeding on these three airfields, as well as on 11 others.

In all these projects, both long term and temporary, the Government of India have been providing all possible assistance and encouragement with a view to building up an efficient and modern air transport system. Air-India International, Ltd., for instance, was formed by the Government as a joint State cum private enterprise with the Government as a 49 per cent shareholder, with the option to acquire at any time a further 2 per cent, and with an Indian concern, Air-India, Ltd., handling day-to-day management.

Considerable assistance has been afforded to flying clubs as part of the State scheme for the training of air personnel, and several are in receipt of fixed subsidies, in addition to other financial aids. Continuing the policy of training air and ground crews, a communications school has been established and is functioning at Saharanpur; a flying school is to be set up at Allahabad; and an engineering school and repair organization at Barrakpur; and these latter establishments, which are scheduled to open before the end of the year, are expected to train 300 control operators, 300 airfield officers, 300 ground engineers, 280 commercial pilots, and 12 pilot instructors for flying clubs, in the first three years.

Bilateral air transport arrangements have been concluded with Pakistan and Sweden, temporary arrangements entered into with Australia, China, Egypt and Switzerland, and negotiations for long-term agreements with these countries and with the U.K. and Iran have started. Bilateral agreements with the United States, France and the Netherlands have already been concluded. India is, of course, represented on the Council of the International Civil Aviation Organization, and preparations are being made for holding the South-East Asia Regional Conference of the Organization in Delhi in November this year, when India will act as the host State.

BREVITIES

A NEW overnight service between New York and Paris is to be started by Trans-World Airline on October 1st. The service will operate once a week on an express schedule, and the Constellation aircraft used will provide sleeper accommodation only for 27 passengers in eighteen berths. This flight will be in addition to T.W.A.'s regular daily flights to Paris.

* * *

K.L.M.'s new round-the-world service—fare £425—is due to come into operation on September 28th with the opening of the Amsterdam-Shanghai route. The service links the company's Amsterdam-New York service with the American North-West Airlines' New York-Shanghai service.

* * *

A report from India states that the Hindusthan Aircraft Company of Bangalore, South India, is to manufacture 30 aircraft by the end of next year. Work is already in progress on the first batch of five. The company's programme includes the assembly of some 15 aircraft from component parts. It is believed that this will be the first time aircraft have been manufactured in India.

* * *

A Miles Gemini fitted up as an ambulance aircraft has been purchased by the Commonwealth Department of Health for work at Darwin in the Northern Territory. The N.S. Wales Health Department has a Percival Proctor similarly equipped stationed at Forbes with the N.S.W. flying doctor.

* * *

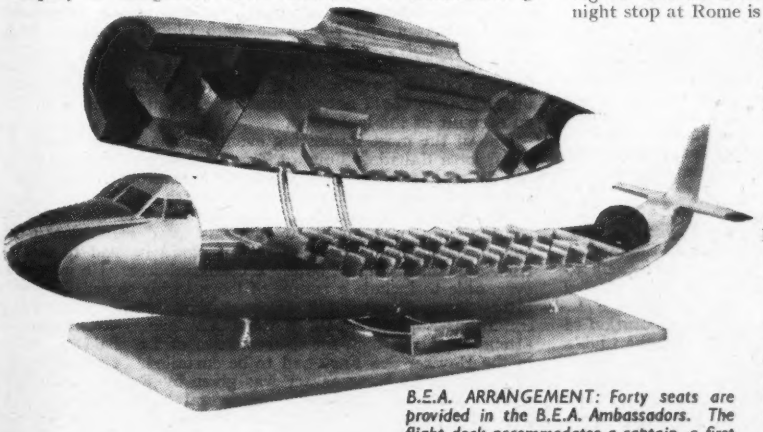
Slight changes in B.E.A.'s Continental services are shown in the corporation's autumn schedules now in operation pending the introduction of winter schedules on October 31st. A night stop at Rome is included on all London-Marseilles-Rome-Athens-Istanbul services, and a later departure from Kensington Air Station, which is now timed for 0945 hrs instead of 0700 hrs as previously, on the London-Brussels run.

* * *

Lord Pakenham, Minister of Civil Aviation, flew to Guernsey on September 17th to attend a meeting of the Channel Islands Joint Advisory Council. He was met at Guernsey by Sir Phillip Neame, Lieutenant-Governor, and the following day carried out an inspection of Jersey Airport.

* * *

American Airlines, parent company of American Overseas Airlines, was recently presented with the National Safety Council's award for 1947 for flying 1,502,499,000 scheduled passenger miles between December 28th, 1946, and the end of 1947 without fatality to passengers or crew. The company also claim to have set up in August an international record between Frankfurt and Berlin.



B.E.A. ARRANGEMENT: Forty seats are provided in the B.E.A. Ambassadors. The flight deck accommodates a captain, a first officer pilot-navigator-engineer and a radio operator.

Civil Aviation News . . .

during which month 1,960,000lb of freight and mail and 3,100 passengers were carried in 912 flights.

* * *

United Air Lines' second officer training school in Cheyenne, Wyoming, has been formally approved by the American Civil Aeronautics Administration, thus becoming the first such school in the country to be approved for a scheduled airline. There are approximately 120 student pilot-engineers currently in training at Cheyenne. In compliance with a Civil Aeronautics Board order, on December 1st they will become the third member of flight crews on the company's fleet of 39 DC-6 aircraft.

* * *

Concessions designed to attract more passengers were introduced by American airlines on September 13th. Wives accompanying their husbands on American domestic airlines will travel at half rates on Mondays, Tuesdays and Wednesdays, air bookings on those days usually being the lightest. The concessions also apply to children under 21 accompanying their parents. Hitherto children under 2 years have travelled free and those under 12 at half fares.

* * *

Two self-propelled tractor belt conveyors have been put into operation by United Air Lines at its Chicago terminal in an effort to reduce unloading time. Mounted on a tractor, the advantages of the conveyor are that it can be brought into position rapidly, and as cargo can quickly be sorted on the belt the need for conventional-type loading stands is eliminated. The lift is designed for baggage up to 450lb in weight, and unloading can be carried out as rapidly as loading. Preliminary tests have shown that a four-engined aircraft such as the DC-6 can be unloaded in 5 minutes or less, while present methods take as long as 9 minutes, and airline officials are considering employing this device at other airports on the company's routes.

* * *

The four Bristol Hercules engines, the reversible pitch airscrews and the constant speed units installed in the Handley Page Hermes IV are operated by the "Bloctube" system of positive mechanical push-pull controls. The control levers in the braking propeller instinctive-type throttle box are connected by the special "Bloctube" ball joints to light alloy bellcrank levers and tubular rods, to the various points to be controlled, the light alloy tubes being supported where necessary by spherical self-aligning oilite bearings. Inter-connected with the pilot's throttle box is another control box, for operation by the flight engineer.

"Flight" photograph.

OPERATION EUROPE: The Saab Aircraft Company's tour with the Scandia will recommence on October 3rd from Sweden, for demonstrations in Switzerland, Spain and Portugal. Coinciding with the I.A.T.A. meeting, it was recently demonstrated in Brussels, and also in Amsterdam.

FROM THE CLUBS

AT the Grand Hotel, Manchester, on October 8th the Lancashire Aero Club will hold their first post-war annual ball. Applications for tickets, price £2 2s, should be made as early as possible to the organizers. The annual general meeting took place on September 21st.

* * *

GLIDER activity is developing at Redhill. Glider launching on strips 015 deg./195 deg. and 075 deg./255 deg. is being carried out on the sides farthest from the Control Tower. Winch launching may involve gliders reaching a height of 1,500ft before the tow rope is released. Appropriate signals are, of course, displayed in the Signal Area when gliding is in progress.

* * *

AT a recent ceremony at Kemsley House, London, General Harold R. Harris, vice-president and general manager of American Overseas Airlines presented several hundred aeronautical maps to Lord Kemsley, and congratulated him on the work of the Kemsley Flying Trust in helping flying and gliding clubs in England in the absence of a government subsidy. The maps were produced by Air-Age Education Research in America and flown to London, for distribution through the Kemsley Trust to the clubs, by A.O.A.

* * *

JUST before the S.B.A.C. display opened the Coventry Aeroplane Club held their first post-war Air Day at Bagington. As the A.W.52 flying wing was flown from Bitteswell to Farnborough it was seen by spectators on its way, piloted by S/L. E. Franklin, who is a member of the club. F/L. "Bill" Else, also an A.W. test pilot, gave a demonstration of aerobatics and inverted flying in a Tiger Moth and the Club's chief instructor, C. M. Joy, made a mock attack, also in a Tiger, upon a Bofors gun crew. The programme was completed by an "instructor-pupil" interlude with S/L. C. K. Turner-Hughes as the "instructor" and Mr. Joy as the keen but clumsy "pupil"; formation flying and a spot landing competition which was won by Mr. E. J. Morton in his 19-year-old Avian, were the last items of an enjoyable programme.

AFTER a week of fine weather hopes were high for a crowd of at least 15,000 for the air display at Newcastle-upon-Tyne Airport on Sunday, September 12th, but rain commenced to fall at 11 o'clock and continued until 6.30 p.m. The show, however, went on, although several items had to be cancelled. About 6,000 spectators endured the shocking weather conditions for four hours, which was some consolation to the organizers and an indication of the attractiveness of the programme; this commenced with a polished exhibition of aerobatics by S/L. Bill Evans, Newcastle Aero Club instructor, on a Tiger Moth. No. 17 Parachute Regiment, co-operating with the Royal Air Force Balloon Unit, demonstrated parachute training, ten men baling out from a moored balloon at 700ft; this was repeated towards the end of the programme. The Darlington and Newcastle Aero Clubs' formation flying was remarkably accurate considering the heavy and persistent rain, the former flying Magisters and the latter Tiger Moths. Spitfire 14's of 607 (County of Durham) Squadron, R.Aux.A.F. unfortunately could not perform their full repertoire of air drill on account of the low cloud.

One of the most interesting events of the afternoon was the flying of a Canadair Four of Trans-Atlantic Airlines. A final low fly-past (at about 100ft) gave the spectators a vivid impression of an aircraft rarely seen in the North.

Mr. Arthur Burmingham, chief instructor of the Newcastle Gliding Club, was unable to give his usual exhibition in the Olympia sailplane. Because of low cloud he had to cast off from the Auster tug at barely a thousand feet. He was, however, able to include a couple of loops in his show. The spectators were disappointed to hear that because of weather conditions Superfortresses of the U.S.A.A.F. were not able to attend, and the high-speed aerobatics of Lt. Baldwin, R.N., in the Hawker Sea Fury had to be curtailed. Throughout the show a running commentary was given by Raymond Glendenning. After the flying display several hundred people were taken for pleasure flights in Rapides and Consuls of Northern Air Charter and Flying Taxis, and a Dakota of British Nederland Air Services which had flown up from Bovingdon the previous day.

H.P. Hermes IV

S.B.A.C. Souvenirs

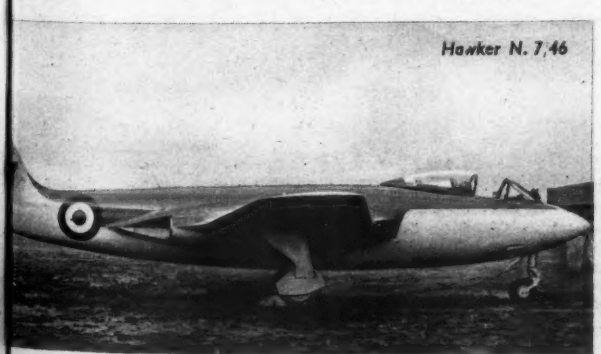
Farnborough Exhibits in Action and Repose

RIVALLING the Airspeed Ambassador in modernity and cleanness of line, the Handley Page Hermes IV transport, as adopted by B.O.A.C., was the object of general admiration. In the heading picture, showing a majestic approach by this our newest airliner, the exceptionally clean installation of the Bristol Hercules engines is visible.

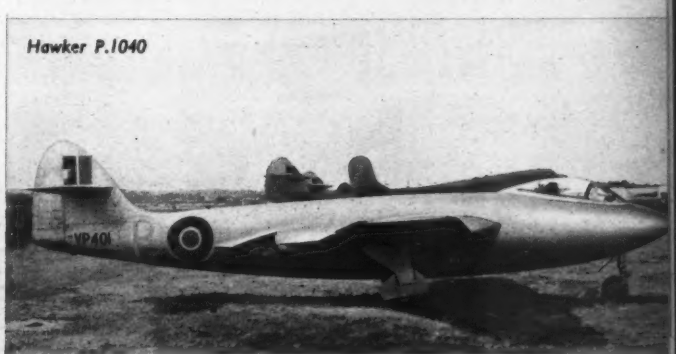
BIRD-LIKE, the Nene-powered A.W.52, flown by Mr. Franklin, shows the public that some of its money has been devoted to the construction of aircraft which, before many years have elapsed, may give Britain a decided lead in military and commercial flying. This 90-foot flying wing attains 500 m.p.h. A version with Derwents also appeared.

THE views below afford a direct comparison between the Hawker N.7/46 Naval jet fighter (left) and its land-based counterpart, provisionally known by its Hawker project designation, P.1040. There are slight dimensional differences and the Naval machine, of course, carries special equipment. Both versions are capable of speeds considerably in excess of 600 m.p.h. and, by virtue of unusually capacious fuselage tanks, are further notable for their range.

A.W. 52

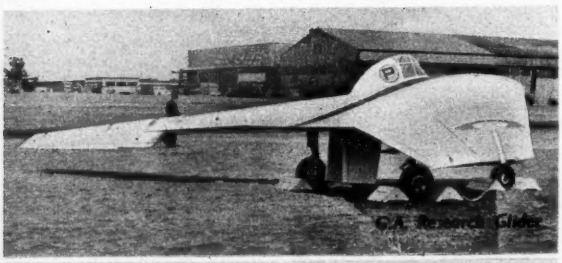


Hawker N. 7/46



Hawker P.1040

Naiad-Lincoln



G.A. Research Glider

G.A. Glider (detail)

S.B.A.C. Souvenirs . . . .

THE first flying test-bed to be employed by the Napier Company for proving its new gas turbine units is the Lincoln (above) with a nose-mounted Naiad propjet in addition to its normal complement of Merlins. This impressive and important machine is seen on a low run, piloted by Mr. Randrup.

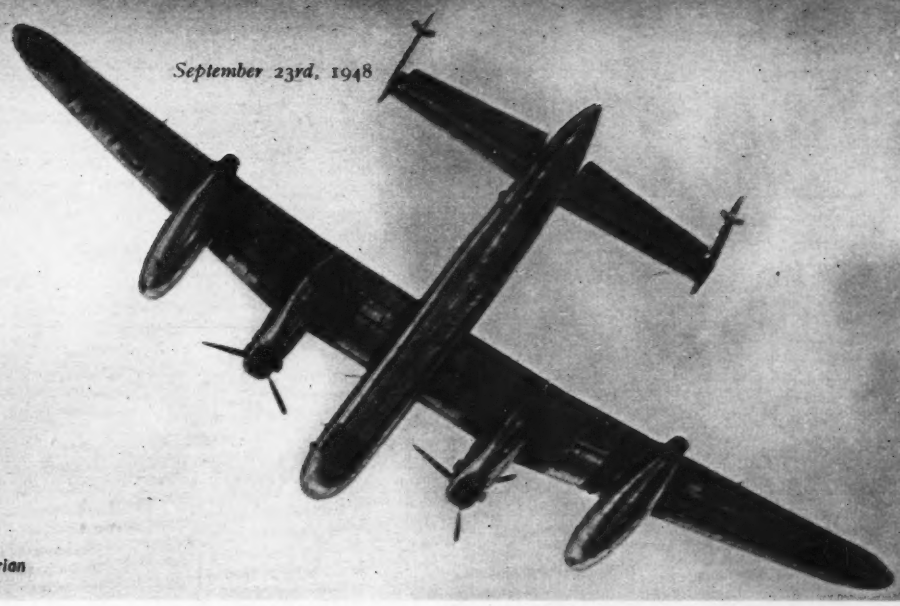
IN addition to a Mosquito, brilliantly converted for high-speed target towing, General Aircraft displayed the latest of their tail-less research gliders. Supplementing the view herewith of the complete aircraft is a detail of the starboard "elevon," or controller, showing the inset tabs. The glider is one of a series built by General Aircraft to Ministry of Supply contract.

AT lower left the clean, compact, Vickers-Supermarine Seagull amphibian is seen before taxying out for a demonstration, with Mr. Lithgow at the wheel. The Rotol contraprop of the Rolls-Royce Griffon engine is in action and the variable-incidence wing is at normal setting.

A SOMEWHAT unexpected, but most welcome, exhibit, the white-painted Hawker Hurricane seen below is used by the Royal Aircraft Establishment for the flight-testing of wings of various sections. The outer panels seen are much thinner than the standard Hurricane mainplanes. It is worth while, incidentally, to compare this view of the Hurricane with the studies of the new Hawker "jets" on the previous page.

Supermarine Seagull

Hurricane (for research)



Avon-Lancastrian

HAVING cut out the Merlins, Captain Shepherd brings the Avon-Lancastrian past the enclosures at over 300 m.p.h., presenting an aspect of his aircraft in which the size and form of the outboard nacelles, housing the latest high-output Rolls-Royce turbojets, may be noted. Details of the Avon are still, as the Americans put it, "classified," but it would be surprising indeed if these units were not of the axial-flow variety.

THE attractive Short Sealand light amphibian was an especially welcome manifestation of the imagination displayed by British designers in planning their post-war aircraft. De Havilland Gipsy Queen engines are fitted in the first few production aircraft, and a version with Alvis Leonides is under development.

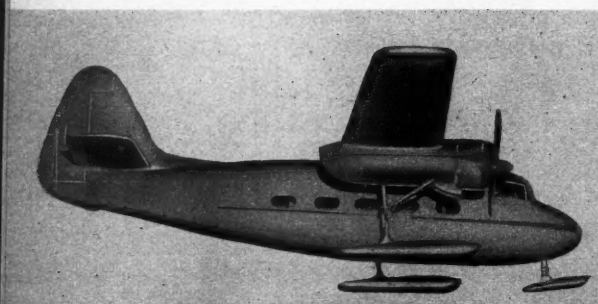
TWO of our latest and most efficient Gipsy-powered light transports are seen below: in the foreground the Miles Marathon, to be built in quantity by Handley Page, and behind it, the de Havilland Dove. In his speech at the inaugural luncheon, the Minister of Supply made reference to the experimental Mamba-Marathon.

EN route from Woodford to Boscombe Down, whence it flew to Farnborough, the Avro Tudor VIII (four Rolls-Royce Nenes) is seen from an accompanying Lincoln. Congratulations are due to Avro and Rolls-Royce, on their last-minute efforts to complete and fly the machine, to Mr. Orrell on his demonstration flights, and to the Ministry of Supply for authorizing the appearance of the aircraft at Farnborough.

Short Sealand

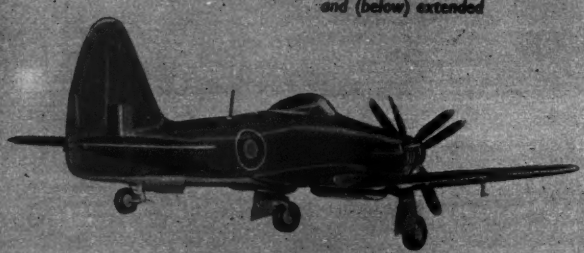
Miles Marathon

Avro Tudor VIII



Percival Prince on skis and on floats

Westland Wyvern with wings folded and (below) extended



Saunders-Roe A1

S.B.A.C. Souvenirs . . . .

ON its first appearance before potential home and foreign buyers the Percival Prince with Alvis Leonides can be said to have been very well received. Widening its field of application as a light transport are the alternative marks with float and ski landing gear, as shown in these attractive models. The Prince is built to carry up to ten passengers at a cruising speed of about 180 m.p.h.

IT was unfortunate that the Westland company could not exhibit an example of their Wyvern Naval strike aircraft at Farnborough this year. It is believed, though not officially confirmed, that the Navy will place orders for the Wyvern, and in view of the declared interest in turboprops, that a later gas-turbine-powered aircraft may be on the way. The wing folding of this carrier-borne design was illustrated by the two models here illustrated.

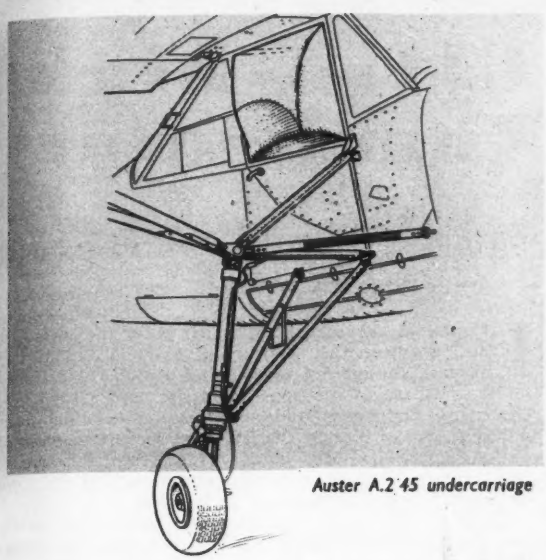
THOUGH progress has perforce been on the slow side, the Eon produced by Elliotts of Newbury in addition to their three gliders, is now flying on the power of a Gipsy Major 10. At Farnborough each day this attractive light aircraft led the flying display by towing off one of its unpowered relatives—the Eon Olympia or Baby Eon—for a brief display of aerobatics.

THERE is no doubt that as a result of its outstanding demonstration in the hands of Mr. Geoffrey Tyson, its unique design characteristics and most unusual appearance, the SR/A1 fighter flying boat with twin Metrovick Beryl turbojets will long be remembered by all who saw its first S.B.A.C. appearance. Much important information and experience is being obtained from the three prototypes, but production is not at present contemplated.

AFTER a period of development during which little was heard of it, the Portsmouth Aerocar, with two Blackburn Cirrus Major engines, again flew at Farnborough this year, and impressed everyone with its lively performance and manœuvrability.

Newbury Eon

Portsmouth Aerocar



Auster A.2/45 undercarriage

THE Auster A.2/45 A.O.P. machine, a detail of which is the subject of the sketch above, is a very much larger, heavier and more powerful aircraft than its predecessors, having a Gipsy Queen six-cylinder engine in place of the four-cylinder "Major" formerly specified. The undercarriage can withstand a high vertical rate of descent.

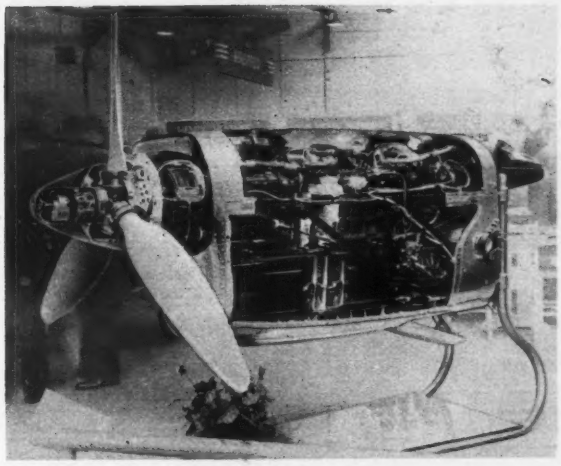
ONE of the most widely used small power plants, the D.H. Gipsy Queen 71 is perhaps best known for its installation in the Dove executive and light transport. The quite astonishing braking effect of the D.H. fully feathering reversible-pitch airscrews with which Queen 71s are fitted, was effectively demonstrated at Farnborough.

THE most advanced fighter design depicted in model form was the Martin-Baker "Delta," shown below. From his position in the leading-edge of the fin, the pilot would have a reasonable, though far from perfect field of vision. Unlike comparable Lippisch designs, the Martin-Baker has a relatively thin wing.

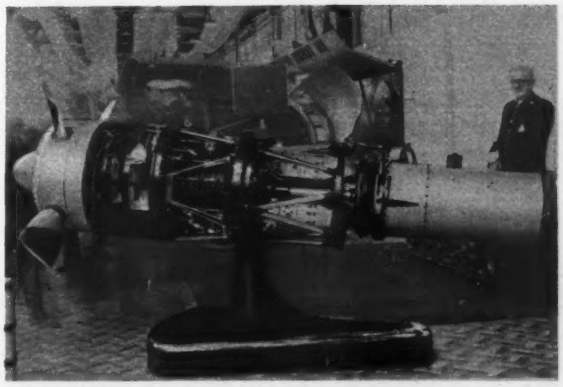
A STANDARD production Vickers Valetta military transport was shown—and flown—with its external stores-carriers in place. For a machine of its size the Valetta is astonishingly capacious and promises to make a most satisfactory replacement for the Dakota.

A SUPERCHARGED six-cylinder, in-line engine with fuel injection was a newcomer seen among the Blackburn Cirrus display. Known as the Grenadier, it is the largest of a new series comprising the 180 h.p. Bombardier, the most advanced; the Musketeer; and the 300 h.p. Grenadier, now commencing development running.

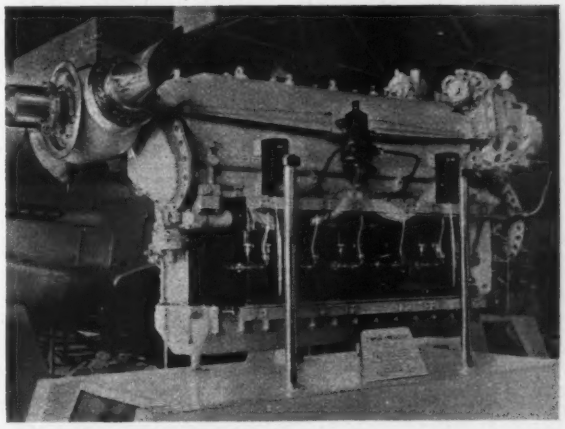
AT the present time Napiers are devoting most of their energy and time to the development of the Naiad gas turbine. Four of these 1,500 h.p. turboprops are to be the source of power for the second Viscount. A very practical cowling has been produced for this installation



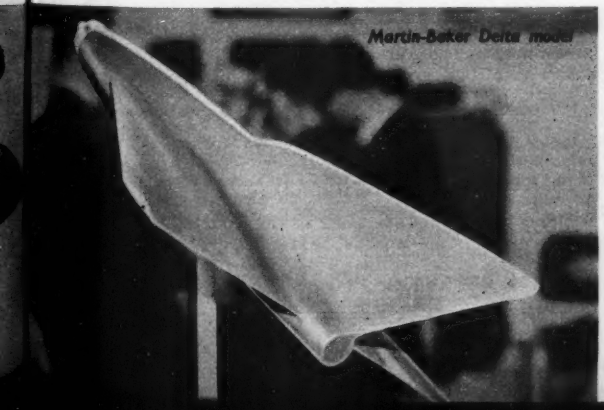
D.H. Gipsy Queen 71



Napier Naiad



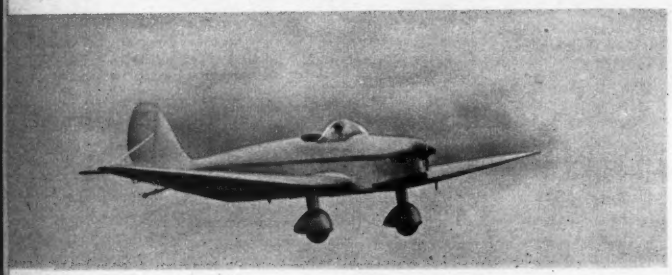
Blackburn Cirrus Grenadier



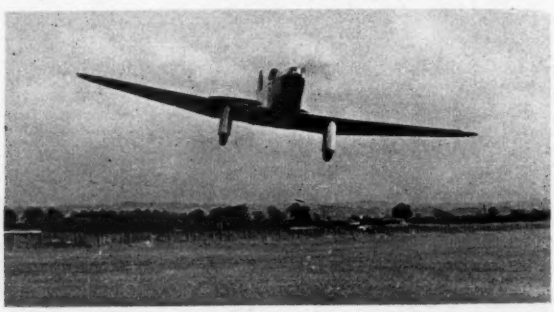
Martin-Baker Delta model

Vickers Valetta

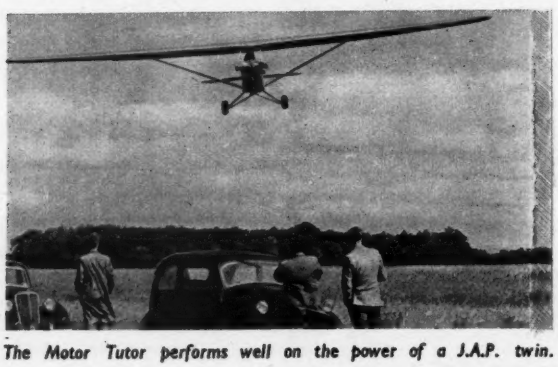
The diminutive proportions of the attractive Fairey Junior are accentuated by the proximity of Mr. F. H. Dixon, its demonstration pilot.



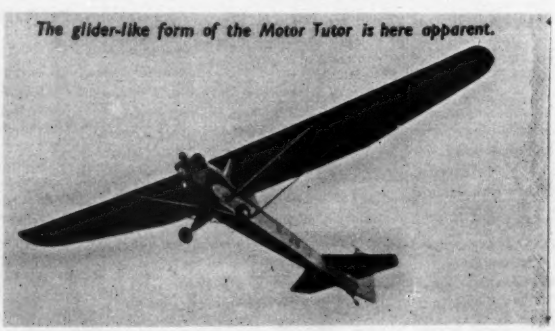
A lively side-by-side two-seater is the pre-war British Tipsy B.



An outstanding performance on 45 h.p. is the Chiltons' talking point.



The Motor Tutor performs well on the power of a J.A.P. twin.



The glider-like form of the Motor Tutor is here apparent.

Ultra-Light Commentary

Aircraft and Engine Activities Today

IN spite of the difficulties which beset the ultra-light enthusiasts in their endeavours to build and fly tiny aircraft, the interest in this kind of flying is definitely on the increase. It is hoped that decisions arising from the many discussions and agreements concerning flight approval, C.s of A, and the like, will soon receive official M.C.A. approval. The work of the Ultra-light Aircraft Association will then be greatly simplified and there will be a firm foundation upon which to build.

There appears to be neither rhyme nor reason for the long delays in regularizing the position of ultra-light flying, and there are certainly very good reasons for encouraging flying of every sort in this country. It is gratifying to know that, as a start, gliding has become officially established in the Services, and its value as a serious part of a pilot's training recognized.

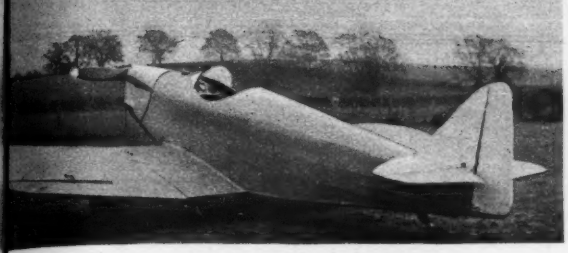
During the last few months two new and very different ultra-light aircraft have been introduced, namely, the Fairey Junior and the Slingsby Motor Tutor. A flight in the Junior with 35 h.p. J.A.P. engine was described in the issue of *Flight* dated June 10th, 1948. This is the simpler, more square-cut version of the Junior, the other Belgian aircraft having a more powerful four-cylinder engine. Hopes for production in England of this sporting little single-seater are not now high because of manpower and material priorities and scarcity of engines.

A Motor Tutor has been seen at one or two North Country meetings but did not show up at Farnborough. Quite a lot of flying has been carried out from Kirbymoorside where these machines are being made. Motor Tutors come into the category of powered gliders, but nevertheless have a useful cruising speed of around 60 m.p.h., and are as near an approach to the foolproof aircraft as has yet been made.

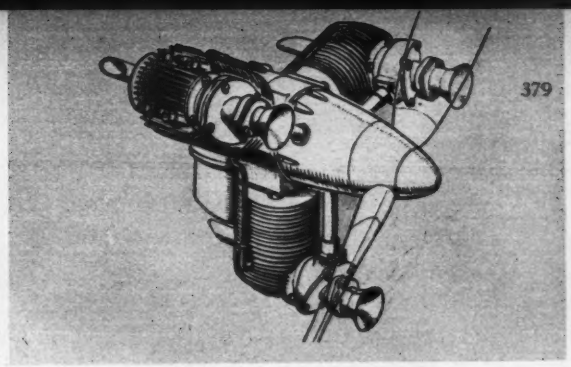
A good deal has been seen of the Chilton during the last year, and quite recently *Flight* was able to renew acquaintance with this diminutive record holder. It is delightful to fly, and is extremely manœuvrable, while the power from the Train engine, which gives 45 h.p. at full throttle, is more than adequate for its normal needs and all aerobatic manœuvres. The safety factor of this entirely reconditioned Chilton is said to be over 10. Another Chilton airframe with Carden Ford engine is intact, but awaits overhaul. Unfortunately, no drawings exist for these aircraft and the cost of making a new set would be prohibitive. Only a very limited permit to fly is, therefore, granted on the strength of pre-war experience.

Some people may have wondered what has become of the Wren Aircraft company's plans for a single-seater low-wing aircraft and a suitable engine for it. The answer is that, for some months, work at Carlisle was unavoidably at a standstill, but that plans have not by any means been abandoned. The Wren Goldcrest, which is designed to fold for towing on the road, has a span of 23ft 3in and a length of 15ft 8in. It is to weigh 600lb, which is 100lb more than the all-wood prototype. With a 35 h.p. engine the top speed will be in the region of 95 m.p.h., the cruising speed 75 m.p.h., and the landing speed 42 m.p.h. Wing loading is 6.2 lb/sq ft. The Wren two-stroke engine is mentioned below.

Other ultra-lights operating in this country, or seen here in recent months, are the Mikron-engined Belgian Tipsy Belfair, the earlier British Tipsy B two-seaters, Aeroncas, the Czech Bibi and the Praga.



Prototype of the Wren Goldcrest single-seater.



Principal characteristics of the Cross radial design are revealed in this drawing.

Power Units

There is a possibility that at least one new light engine will be developed during the year, and two important designs are under consideration. Mention has been made of a unit to be designed by Mr. E. Turner, of the Triumph Engineering Co., Ltd. Mr. Turner has indicated that he is personally interested, but says that so far there is no more to it.

An intriguing design is that prepared by Mr. Cross of rotary-valve fame. He has the preliminaries on paper for a 1,500 c.c. three-cylinder radial to give about 50 h.p. for take-off at 3,000 r.p.m., or 60 h.p. at 4,000 r.p.m. with a 2:1 reduction gear. The purpose of the design is to produce a simple, reliable and economical unit capable of long running periods without attention. Weight is not of paramount importance in engines of this size, the difference between 2½ and 3½ lb/h.p. being only about 50lb. It is better to have really sturdy and dependable construction which is on the heavy side than a light but delicate one. The weight of the Cross would be 140lb, and the fuel consumption two gal/hr for cruising. Dual ignition would be fitted and a separate carburettor for each cylinder.

Until such units as the Turner and the Cross become available, pilots will be dependent upon a number of J.A.P.s of the 35 h.p. H.O. twin type, and perhaps one or two Anzani inverted vee units.

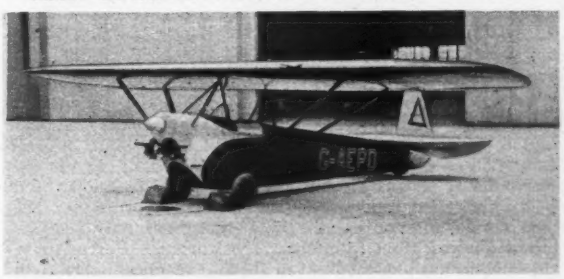
Before the war a few Coventry Victor engines were built, and small N-type stationary power plants, similar in many ways, have continued to be produced. Mr. Weaver has stated that the company would consider building more small aircraft engines if a suitable order were forthcoming.

Wren's flat-four two-stroke engine is designed to develop 35 h.p. for take-off at 4,000 r.p.m., and 25 h.p. for cruising at 2,800 r.p.m. A reduction gear of 0.64 ratio is to be fitted, and the weight will be about 85lb. The January 23rd, 1947, issue of *Flight* refers.

Import restrictions rule out purchases of small engines from abroad—at least from dollar countries—and the position with regard to Czechoslovakian units such as the Praga, Walter and Zlin Persy, is at present obscure. France has produced a number of engines of around 50 h.p. output, such as the Mathis and Train. A limited number of individual applications for import permits might receive favourable consideration on the grounds that at the present time there is no comparable British product available. Few products are developed and marketed successfully solely for either home or export consumption, and it seems that for success to-day sales at home and abroad must go together. Prototypes must be developed at home which exhibit sound British characteristics if advantage is to be taken of export possibilities.

The revival of interest in light aircraft is by no means confined to Great Britain and, in fact, one now finds great enthusiasm for all forms of private flying on the Continent. Currency restrictions, providing cost is kept reasonably low, should not be insurmountable obstacles, but it should be remembered that pilots on the Continent expect their aircraft, and for that matter cars, not only to perform well but to look well. Among club light aircraft there is very considerable competition from the very many smart and up-to-date American designs. However, an attractive new ultra-light would have a fairly open field, and might well prove an acceptable item on our export list.

Chilton—the smallest 100-kilometre closed circuit record holder.



An easy-to-build pre-war design, this Luton Minor has a V-twin Anzani engine.

Juniors over Windsor. The J.A.P. (nearer) and Mikron versions formate.

CARRIER-BORNE BOMBER

Composite Powered XAJ-1 : P. and W. Double-Wasps and a G.E. Turbojet

THE latest in U.S. fission fashions is announced by North American Aviation, Inc., acting in concert with the U.S. Navy. (The fission part may be pure fiction, of course, but guessing is still uncensored, as well as a good sport, on both sides of the Atlantic.) While the flight debut of this aircraft has been publicly known and seen—and even reported in the American press—for the past couple of months, the U.S. Navy has only just removed its iron glove from the velvet curtain. Fortunately, the curtain has not yet been made that reaches higher than the airport fence.

Apart from any guesswork about the naval functions of this aircraft, the main technical interest centres around the composite power plant, featuring a pair of Pratt and Whitney Double-Wasp piston engines on the wing and a General Electric (Allison) turbojet in the rear of the fuselage. This mixed power plant theme is apparently still a favourite with the U.S. Navy and has been seen before in the Ryan Fireball fighter and the Martin Mercator bomber. The piston engines with their Hamilton four-bladed airscrews provide high thrust for carrier take-offs and also good high-speed performance at altitude, and are used, therefore, for normal operations. The turbojet remains up the fuselage sleeve, so to speak, to be cut in for speed-boosting under combat conditions.

In size, the XAJ-1 is similar to North America's B-45 four-jet short-range bomber for the U.S. Air Force, which means that it is bigger and heavier than present carrier-based types. Nevertheless, it is lighter than the Navy's Lockheed Neptune, which has recently completed a number of successful carrier take-offs. A crew of three is carried in a pressurized cockpit. Other features not observable in the accompanying photograph are a tricycle nose-wheel landing gear and folding wings and tail for ease of handling and deck maintenance. The outer panels of the wing fold up and inward, while the vertical tail folds against the starboard surface of the horizontal tail.

One noticeable feature is the very neat streamlining of the underslung piston engines on the wing, for not only is the nacelle itself exceptionally clean-cut and free of unsightly blisters, but the cowl lines are well faired into the laminar-flow wing profile. Flush-type exhaust exits are located on the sides of the cowl underneath the wing—where they appear well-placed to scorch the lower wing skin. Whether this particular installation is intended as a thrust augmentor is not known, but in that case one might have expected to see the exhaust carried through clear to the tail of the nacelle, similar to the arrangement seen in the Republic XR-12 Photo-Scout and, more recently, in the Convair-Liner transport. Such a scheme has the dual merit of carrying the exhaust clear of the wing and providing a modicum of jet propulsion.

Obscured in the official picture is the air intake to the central turbojet, which is aspirated by fuselage side nostril ducts located under the wing. Also discreetly hidden are the long, ingeniously designed bomb-bay doors, which give the impression that the XAJ-1 is designed to play the rôle of a carrier-based atomic bomber. This seems a logical deduction, since the U.S. Navy is now laying down the World's super carrier expressly designed for atomic bomb delivery—presumably in an effort to trump the Air Force. This carrier will have a flush-deck, a waterline length of over 1,000 feet, and an estimated gross tonnage of around 80,000 U.S. tons. Top-ranking Air Force opinion has publicly berated this ambitious project as "a highly vulnerable ocean platform for launching a few bombers against enemy industrial centres."

Apropos the XAJ-1, there is some doubt as to whether this particular brand of fruit compôte is quite the dish the U.S. Navy appears to think it is. In view of current progress with turboprop engines, by the time this big American carrier is launched in 1952, the high-powered piston engine may be outmoded. Despite recent progress in America with the compound piston engine (both Pratt and Whitney and Wright are developing this type), it seems much more logical—if one must serve a mixed dessert—to concentrate entirely on the turbine engine. On paper, at any rate, the most promising combination of all was undoubtedly the turbojet with ducted fan; hence it would be interesting to know the current status of this type of composite turbine.

While, therefore, the XAJ-1 is an interesting example of current American naval air thinking, in the opinion of this writer (a mere layman), it seems a fantastically expensive way of delivering an atom bomb on the target. The aerial part of the bill is practically unnoticeable, compared with the cost of the giant carrier and its huge flotilla of protective escorts, representing in all a total investment roughly estimated to run as high as 1,000 million dollars. All this expensive convoy offers a sitting target close in-shore for the latest type of submarine, against which no satisfactory protection has yet been devised. Clearly the American taxpayer is about to learn the high price of admiralty in this post-atomic age.

"FAVONIUS."

AIRCREW SELECTION

The R.A.F.'s Methods of Choosing Flying Personnel

Candidates undergoing one of the two audiometric tests included in the medical examination. Keenness of hearing is gauged from the accuracy with which they transcribe 40 simple words dictated to the roar of aircraft engines.

THE complex and responsible business of picking out the right type of volunteer for aircrew training in the Royal Air Force, which has been underlined by the present recruiting drive, has for some time been carried out with steady success by the Combined Selection Centre, now operating at North Weald, although it is expected that the Centre will move shortly to make way for two Auxiliary Squadrons.

W/C. M. P. Thompson is Commandant of the Centre, and is directly responsible to the Deputy-Director of Selection, G/C. W. A. Hammerton, who is the guiding influence on the policy of all selection procedure throughout the Service. Under the new scheme, it is planned to take in 50 volunteers a day, each of whom will, after completing identical tests spread over five days, be classified as acceptable in the categories of pilot, navigator, engineer, signaller or gunner—unless he is found unsuitable in health, aptitude or character. An unpredetermined number of candidates accepted as pilots and navigators will be guaranteed short-service commissions (subject to successful completion of training) if found suitable during the tests at the Combined Selection Centre. It is intended that between 600 and 700 commissions a year will eventually be awarded under this system.

Broadly speaking, procedure may be split into three main stages: the medical examination, aptitude tests and character-assessment. The type of volunteer varies considerably; A.T.C. cadets who have just reached the qualifying age of 17½ sit next to the relatively veteran airmen who feel they have been grounded long enough.

One of the first indications of potential skill as a pilot is given by a successful performance in a dummy cockpit where a spot of light on the screen has to be kept central.

About 10 per cent of the candidates are generally rejected for medical reasons—mainly through faulty vision. The medical examination naturally demands, as it always has, an extreme standard of physical fitness. Earphones and gramophones are used in two tests for hearing. In the first, 40 one-syllable words are spoken against a background of what suggested to us the sound of four Merlins at take-off boost! A candidate must score at least 60 per cent to pass this test. The second record is to check possible high-tone deafness, and consists of a series of "pips" at frequencies between 4,000 and 250.

Aptitude Trials

The medical examination, which lasts about half a day, is followed by the 20 aptitude tests, occupying a day and a half; the first four tests are carried out with apparatus, and the remaining 16 with pencil and paper. Forty-eight square pegs fitting into four rows of holes comprise the first test, which is an assessment of finger dexterity. In 35 seconds the candidate must remove, turn through 180 deg., and replace, as many pegs as possible, the top of each peg being painted half black and half white to indicate the score. The second aptitude test makes use of a slowly revolving drum, with an ivory surface, upon which is a spiral irregular track of holes. The candidate operates a wheel giving him delayed-action remote control of a lever ending in a small ball; an assessment of the amount of co-ordination between hand and eye is made by measuring the success with which he follows the row of holes with the ball. The machine records electrically the scores made in three runs.

In the third test, which has a more obvious connection with piloting an aircraft, the candidate sits in a dummy cockpit, containing a rudder bar, control column and throttle lever; in front of him is a white screen with a small spot of light upon it. During the test, the spot of light tends to stray all over the screen, and only rapid movements of the controls will retain it in the correct position, a small square in the centre of the screen. For added complication, red and white lights flash on, which must be switched off with the "throttle control." This apparatus also records the candidate's score, and checks his co-ordination between hands, eyes and feet. The final apparatus test is a simple Morse aptitude trial, in which 78 pairs of Morse groups are transmitted through earphones with increasing speed and complexity. The candidate must state whether or not in each pair of symbols the second group is identical with the first.

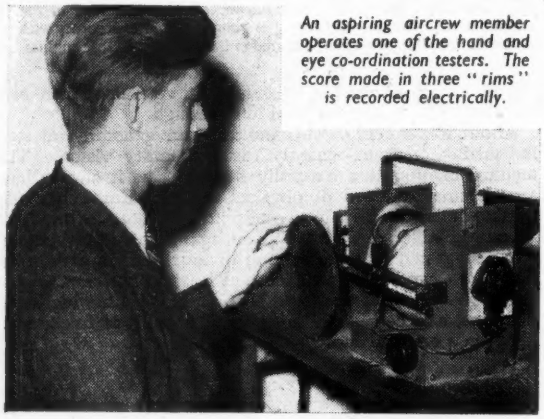
The 16 remaining aptitude tests are so timed that it is virtually impossible to complete any of the papers, thus

Aircrew Selection . . . . .

allowing easier judgment of capability than if a number of candidates of varying proficiency all had time to complete the tests. The first five tests of this series deal with general knowledge and intelligence, one providing reserve information should a candidate later take up a ground trade.

Thirty-six minutes are given to an examination of the candidate's knowledge of aviation topics, on the principle that any keen prospective member of aircrew would gain as much knowledge of flying as possible. There are five tests in mathematics, three of which provide a choice of answers; a speed test in which the candidate must simply class answers given as right or wrong; and one with problems based on reasoning rather than difficult calculations.

Four tests give the selectors information of the candidate's knowledge and powers of assimilating knowledge, of mechanical subjects, and there are two fairly simple papers on instrument comprehension. Powers of observation are assessed by the use of aerial photographs and maps. The candidate is required to locate small portions of an area on a large representation. The sixteenth and final test—in aircraft recognition—also calls for good powers of observation, as the candidate is given a silhouette of a particular aircraft and must identify it among a selection of five in flying attitudes.



An aspiring aircrew member operates one of the hand and eye co-ordination testers. The score made in three "rims" is recorded electrically.

Twelve squadron leaders and flight lieutenants are engaged singly in the next stage of the selection procedure —the first interview. It has been decided that the R.A.F. needs in its aircrew personnel nine character traits; and the interviewer, having before him a personal history form completed before the medical examination, gives the candidate a rating for the degree to which he possesses each of these traits, forming his impressions from his conversation with the candidate Next follows the Classification Board, who are empowered to reject entirely or recommend a candidate as a commissionable pilot or navigator, or as aircrew member of any categories.

Final acceptances are made by Junior and Senior Boards. The six Junior Boards, each consisting of a squadron leader and a flight lieutenant, can accept as aircrew for any category, or can, of course, reject candidates. Men who are recommended by the Classification Board or Junior Board as commissionable go on to one of three Senior Boards, composed of a wing commander and a squadron leader. The Senior Boards deal also with candidates whose aptitude score is low, but who have done well in the interview. The function of the Senior Boards is thus to guarantee to suitable candidates a short-service commission, subject to passing flying and officer training, and to accept aircrew pilots and navigators with possible commissioning at a later date. Candidates in whose case a decision is difficult to make are seen in person by W/C. Thompson, the Commandant, who also makes the final decision in all cases dealt with by the Senior Boards.

Should it appear from the foregoing that the Selection Centre consists of a frightening succession of tests and boards, let us hasten to say that all the officers concerned are most anxious to put candidates at their ease, that the organization is smooth and the conditions comfortable, so that each should do his best. R. J. B.

ADHESIVE DEVELOPMENTS

As most readers of *Flight* are aware, Aero Research, Ltd., of Duxford, are specialists in high-strength synthetic-resin adhesives and since 1934, under the direction of Dr. N. A. de Bruyne, have carried out extensive research in this field with particular reference to aircraft structures.

Last Thursday they took advantage of a convention held at Cambridge by the Institute of Metals to invite members of that organization, and other visitors, to see the developments on which they are now engaged; apart from aircraft, this work covers industrial production from skis to window-frames and tennis-racquets to furniture. But the aircraft side remains, of course, a very strong one, and some interesting exhibits were on show to the visitors. Apart from examples of the now well-known Redux process (used, *inter alia*, for metal-to-metal bonding in the Dove wing and metal-to-wood in the wings of the Mosquito and Hornet and the floor of the Vickers Viking), there was a section of helicopter rotor-blade in which, to give sufficient thickness for rivets to be countersunk in a 26 s.w.g. skin, strips of alloy were bonded to the skin on the line of each rib. There was also an example, from an aircraft still in the development stage, in which the skin was bonded to a corrugated structure of heavier gauge; involving double curvatures, this was a good illustration of the adaptability of the process.

Other aircraft exhibits included applications of Gordon Aerolite glue as used in the all-plastic wing now being developed by the R.A.E. and, in a rather different sphere, the extensive use of Redux in the construction of the radiator-like brass containers which house the contact lines used by Flight Refuelling, Ltd.

Though not yet put forward for aircraft applications—in which, however, its value seems unquestionable—a remarkable adhesive known as Araldite was demonstrated. Developed by the Swiss firm of Ciba, who have lately acquired a controlling interest in Aero Research, Ltd., it is intended for the bonding of metals to metals (especially light alloys) and metals to glass and other vitreous materials. Giving a bond strength in many cases greater than that of the material itself, it is almost absurdly simple to apply, the only requirements being light pressure and a short curing period ranging from 10 min at 240 deg C to 2 hr at 180 deg C.

FIRST BRITISH-BUILT S.51. There was much disappointment at Farnborough that the Westland-Sikorsky helicopter could not be shown. This picture shows it to follow the American prototype fairly closely in external appearance, but the power plant is different, being an Alvis Leonides mounted horizontally.

NIMONIC ALLOYS

Their Application to Aircraft Gas Turbines

SINCE 1908 various materials based on the 80/20 nickel-chromium solid solution and capable of useful life under continuous or intermittent service at high temperatures, have been used in the electrical heating industry. The Nimonic series of alloys retain the characteristic resistance to corrosion and oxidation of the 80/20 alloys but are specifically intended for use where only a limited amount of creep deformation can be tolerated under load at high temperature. Developed with great urgency for aircraft gas turbines during the war the first three alloys of the Nimonic series are now in regular service.

Gas turbines provide the most arduous instances of high-temperature operation. Conditions are severe and cannot always be anticipated as, in some components, the calculated conditions are combined with unknown and variable effects of temperature gradient. The main effect of stress at high temperatures is continuous deformation or "creep," which will eventually lead to the failure of the part by loss of dimensions or even fracture. A typical curve, Fig. 1, shows the course of strain is not consistent. There is a primary stage in which the rate of creep decreases rapidly, a secondary stage during which the rate decreases slowly or may be substantially constant, and a tertiary stage when the rate increases rapidly and leads eventually to fracture. Present knowledge of the conditions during the tertiary stage prior to fracture is incomplete, and it is wise to limit the working life of a component to the determinable period of the secondary stage.

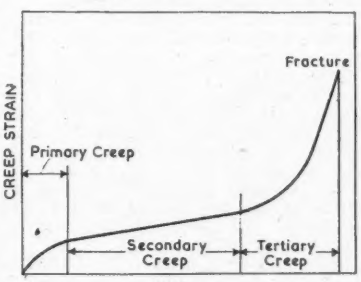


Fig. 1 Typical creep curve.

Resistance to both corrosion and oxidation should be of a high order since under conditions of tensile stress they influence the time to the onset of tertiary creep. Furthermore, reduction of metal thickness owing to inadequate resistance results in loss of load-carrying capacity. Thermal expansion is also important, and components with normally only little stress must possess adequate strength to carry additional stresses imposed by temperature gradients. Thermal conductivity may be a factor of some influence where conduction of heat through the metal, relative to that through the oxide, is of importance.

As an example, the material of the rotor blades of a turbine is subject to centrifugal stress due to rotation at high angular velocity and to bending stress due to the pressure of the impinging gas. Under these stresses the material elongates

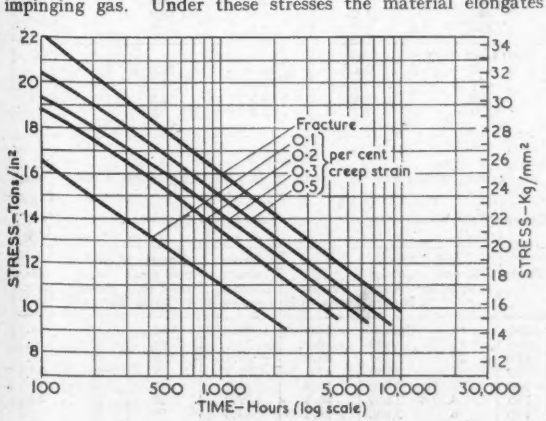


Fig. 2 Design data for Nimonic 80 at 700° C.

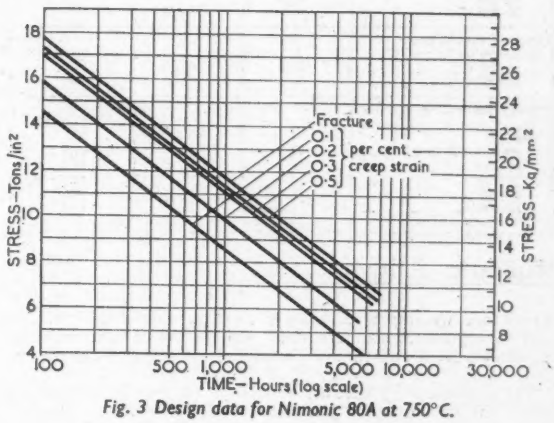


Fig. 3 Design data for Nimonic 80A at 750° C.

with time and it is necessary to estimate the overall elongation of the blade so that tip clearance can be maintained. Since the efficiency of the turbine is increased by keeping this clearance low, the capacity of the material to resist "creep" is of major importance.

Where the properties of a given material are required for design purposes, a series of tests is carried out at a variety of stresses and at two or three temperatures covering the working range. The determination of creep strains with time are plotted in a family of curves, as shown in Figs. 2 and 3 for Nimonic 80 at 700° C and Nimonic 80A at 750° C respectively. Sensitive extensometers are needed for the measurement of strain, and temperatures must be closely controlled to avoid errors in measurement. Plots are made from observation of the increase in length of specimens loaded uniformly and under constant temperature.

Information of a short-term character, up to 1,000 hours, can be obtained with simpler apparatus. This equipment is used for the evaluation of experimental alloy compositions and investigations of the effects of heat treatment. It also serves for the routine tests deemed necessary for each heat of alloys used for aircraft turbine blades.

Operational stresses

In practice, a turbine blade is subjected to centrifugal stress, bending stress and bending and torsional oscillations. This implies that the surface finish of the blade itself is of importance, particularly at the leading and trailing edges. Nozzle guide vanes are subject to higher temperatures, a small gas-bending strain and little or no vibrating effect. The stator ring supporting the guide vanes exercises a cooling effect, however, which leads to a high temperature gradient at starting. Frequent starting and stopping of the turbine may lead to cracking or buckling of the guide vanes and consequently a high resistance to oxidation under such conditions is of first importance. In addition, the materials must be readily capable of fabrication.

Components of combustion chambers are rolled from sheets, formed and welded. Stator blades can be formed from rolled section or precision cast by the "lost wax" process. Rotor blades are preferably produced from a forgeable alloy. Precision casting may be used for rotor blades, but in this form these materials have less resistance to fatigue stresses than have forgings. As operating requirements are raised the difficulty of forging will increase and, furthermore, the machineability will decrease.

Nimonic 75, the first alloy of the series, was developed for the early Whittle gas turbines. Forged and rolled to sheet, it was used for the flame tubes of the combustion chambers. Its performance in this component is due to a combination of properties; high creep and fatigue strength at the operating temperature, a relatively low coefficient of expansion, good resistance to oxidation and corrosion and a firmly adherent oxide scale. Forming by hand-beating, spinning, pressing or rolling is facilitated by its high ductility at room temperature.

TABLE I.
Physical Properties of Nimonic Alloys.

	Nimonic 75	Nimonic 80	Nimonic 80A
Specific Gravity	8.35	8.2–8.25	8.2–8.25
Specific Heat (cal/g.°C.) ...			
20–100° C.	0.11	0.103	
20–900° C.	—	0.128	
Thermal Conductivity g. cal/cm/sec/sq cm/° C. ...			
at 100° C.	0.03	0.029	
at 900° C.	—	0.066	
Mean Coefficient of Thermal Expansion in millionths per °C.			
20–100° C.	12.2	11.7	11.9
20–300° C.	13.4	12.8	13.0
20–500° C.	14.1	13.6	13.7
20–700° C.	15.4	14.3	14.5
20–900° C.	16.0	15.7	15.8

Nimonic Alloys . . . . .

Resistance welding is commonly used for this sheet material and its high electrical resistivity reduces the current required to effect a weld and its low thermal conductivity localizes the heat.

The coefficient of expansion, similar to that of mild steel, keeps the distortion of Nimonic 75 to a low order. As the efficient operation of the flame tube of a combustion chamber is dependent on the retention of shape, the resistance to distortion afforded by the high mechanical strength is a marked advantage. Its strength does not begin to fall off rapidly until a temperature of about 1,000 deg C is reached and it is resistant to oxidation at temperatures of the order of 1,100 deg C. Nimonic 75 is used for components of the combustion chambers of most British aircraft turbines.

The properties of Nimonic 75 fit it for use in the form of rolled, forged or cast nozzle guide vanes for gas temperatures of 800 deg C or above. It is eminently suitable for precision casting by the "lost wax" method and thus renders possible the production of relatively intricate guide vane assemblies. Turbine stator rings can also be forged in Nimonic 75.

Nimonic 80 is the standard material for the rotor blades of all production aircraft turbines in Britain, and a wide experience of satisfactory service has been accumulated. From Table I it will be seen that the physical data are similar to those for Nimonic 75.

TABLE III
Mechanical Properties of Nimonic 80.
Torsion Tests

Temp °C.	Diameter of Test Bar in.	Limit of Proportionality tons/sq in	Proof Stress tons/sq in			Modulus of Rigidity lb/sq in
			0.1 per cent.	0.2 per cent.	0.5 per cent.	
20	0.300	20.2	28.2	29.6	31.0	12.55×10^6
350	0.300	18.0	25.9	27.1	28.1	11.20×10^6
450	0.300	18.5	24.4	25.6	26.5	10.40×10^6
550	0.300	18.2	25.3	26.0	—	10.40×10^6
650	0.300	18.6	26.4	27.6	28.7	9.75×10^6
700	0.300	18.5	24.1	24.8	25.1	9.50×10^6

Tensile Tests

Temp °C.	Proof Stress tons/sq in			Maximum Stress tons/sq in	Elongation per cent. on $4\sqrt{\text{Area}}$	Red. of Area per cent.	Young's Modulus lb/sq in
	0.1 per cent	0.2 per cent.	0.5 per cent.				
200	39.6	40.6	42.6	66.0	45	36	31.4×10^6
300	39.6	40.5	41.1	64.0	44	41	30.5×10^6
400	33.9	34.1	34.4	57.6	45	43	28.5×10^6
500	36.4	36.6	37.0	57.6	45	42	27.6×10^6
600	36.4	36.9	37.5	48.4	25	19	26.3×10^6
700	35.0	35.8	36.5	38.0	7	12	24.1×10^6
800	21.6	23.1	24.0	31.6	8	10	19.6×10^6

Fatigue.—Stress for endurance at 40×10^6 cycles in 300 hrs.

Temp °C.	Stress Tons/sq in	Temp °C.	Stress Tons/sq in
20	0 ± 22	650	16 ± 8
600	20 ± 13.5	650	0 ± 18.3
600	0 ± 19	700	12 ± 8
650	14 ± 9	700	0 ± 16.7

TABLE II
Mechanical and Creep Properties of Nimonic 75.
Tensile.—Relate to 0.625in dia. bar.

Temp. °C.	Modulus lb/sq in	0.1 per cent Proof Stress tons/sq in	Maximum Stress tons/sq in	Elongation per cent $4\sqrt{\text{Area}}$	Red. of Area per cent
Room Temperature	30×10^6	30	46	50	50
750	—	10.2	22.8	28	29
800	—	7.5	18.2	33	28

Creep.—Relate to 1.0in dia. bar

Temp. °C	Stress for 0.1 per cent. creep strain in 300 hours (tons/sq in.)
600	8.8
650	6.7
700	4.3
750	3.1
800	2.1

Fatigue.—Stress for endurance at 107 reversals.

Temp °C.	Stress tons/sq in
20	±16.8
750	±12

Properties depend on the condition and previous heat-treatment of the material. The figures above are for material solution-treated for 2 hours at 1,225°C.

For the design of blades, the creep deformation in periods up to 300 hours is of use in selecting operating conditions. The most severe conditions of stress and temperature occur during take-off and climb, and since most of the working life is under less arduous cruising conditions, the properties of the material must be considered at both upper and lower orders of stress and temperature. Tables III and IV provide the type of design data the engineer can use. Coupled with these data are the results, Table V, of the examination test pieces after creep tests of considerable duration.

Nimonic 80, recommended for operating temperatures up to 750 deg C, is essentially a forging alloy. Its merit lies not only in amenability to manufacture, but also in resistance to fatigue which is difficult to attain in any cast alloy. In considering fatigue, material possessing an inherent capacity to damp out vibration is desirable. Experiment shows, however, that a high damping capacity is not associated with high resistance of deformation under load. Accordingly, it is held to be of advantage to adopt a mechanical method of blade fixing, providing mechanical damping at the root. It is of interest to note that the few isolated cases of fatigue failure so far observed have been associated with undue tightness of the blade fixing.

From experience in the manufacture and in the behaviour of Nimonic 80, a variant alloy designated Nimonic 80A has

TABLE IV
Creep Characteristics of Nimonic 80.

Time and Temp. °C	Stress (tons/sq in) to produce creep extension of			
	0.1 per cent	0.2 per cent	0.5 per cent	Rupture
100 Hour Data				
600	29.5	32.0	33.0	33.5
650	21.0	24.5	26.5	28.0
700	16.5	19.0	20.5	22.0
750	10.0	12.5	14.5	15.0
300 Hour Data				
600	25.5	29.0	31.0	32.5
650	19.0	22.0	24.5	25.5
700	14.0	16.5	18.0	19.0
750	8.0	9.5	11.5	13.0
1,000 Hour Data				
600	22.0	25.0	28.0	29.5
650	16.5	19.5	21.5	22.5
700	11.0	13.5	15.0	16.0
750	6.0	7.0	8.0	9.5

TABLE V
Mechanical Properties of Nimonic 80 after Long-Time Creep Tests

Creep Test Conditions			Tensometer Tests				Izod Test
Temp °C	Stress tons/sq in	Duration of Test Hours	Yield Point tons/sq in	Maximum Stress tons/sq in	Elongation per cent on $4\sqrt{\text{Area}}$	Red. of Area per cent	Impact ft/lb
650	9	10,600	53.0	74.5	27	27	n.d.
650	12	13,000	50.0	74.0	22	19	n.d.
650	21	2,350	48.5	73.5	26	25	n.d.
700	7	3,580	42.5	75.5	25	37	n.d.
700	7	4,160	35.0	71.0	30	36	37
750	4	2,660	46.5	77.0	28	30	34
750	6	3,000	36.5	64.0	17	22	n.d.
750	8	3,500	36.5	68.0	30	30	n.d.

Nimonic Alloys . . . . .

been developed. It is superior to Nimonic 80 in load-carrying capacity at the lower temperatures and can be used for relatively short-time service at temperatures ranging up to 820-850 deg C.

For design purposes involving high temperatures the use of factors of safety is somewhat complex but can conveniently be sub-divided into factors of stress, temperature and time. In the moving blades of a turbine, for example, the centrifugal and bending stresses are known. A factor of safety is necessary to cover departures from the nominal stress arising from error in blade dimensions allowed on the profile and to cover the effect of stress raisers, where occurring as machining marks or brought about in service. In applying creep test data to turbine design the following considerations should be kept in mind.

(1) The total permissible deformation should not be exceeded in the extended time provided by the assigned time "factor of safety."

(2) If the worst conditions of stress, temperature and time are assumed to be operating for the life of the component, the rupture figure should certainly not be exceeded and preferably the time defining the onset of tertiary creep should not be overstepped.

The alloys commence to melt at about 1,380 deg C. Nimonic 75 can be forged successfully in the temperature range 1,180-1,230 deg C and can be continued down to about 1,050 deg C, although it becomes increasingly difficult. Forging of Nimonic 80 and 80A is performed satisfactorily in the range of 1,050-1,150 deg C. Stiffness of these materials increases rapidly below 1,000 deg C and frequent reheatings are necessary. In forging turbine blades it is preferable to deliver only one or, at the most, two blows between reheatings. The furnace atmosphere should be oxidizing and the fuel used should have a low sulphur content.

TABLE VI
Creep Characteristics of Nimonic 80A

Time and Temp. °C	Stress (tons/sq in) to produce creep extension of			
	0.1 per cent	0.2 per cent	0.5 per cent	Rupture
100 Hour Data				
650	26.0	28.5	29.5	30.0
700	19.0	23.0	24.5	25.5
750	14.5	16.0	17.0	17.5
300 Hour Data				
650	23.0	26.0	27.0	27.5
700	15.5	19.5	21.5	22.0
750	11.5	13.0	14.5	15.0
1,000 Hour Data				
650	20.0	22.5	24.0	24.5
700	11.5	15.5	17.5	18.0
750	8.5	10.0	11.0	11.5

The heat treatment of Nimonic 80 and 80A comprises a solution treatment of eight hours at 1,080 deg C, followed by an ageing treatment of sixteen hours at 700 deg C. Air is the preferred furnace atmosphere. The extended period at the high solution temperature produces an altered superficial layer having a maximum thickness of 0.003in. This should be removed by machining or other means, prior to placing the part in service. Both Nimonic 80 and 80A are adversely influenced by cold working, the effect of which is to increase the rate of creep under given conditions, thus leading to failure by rupture in a shortened time at a large elongation.

SIDDELEY TROPHY COMPETITION

IT is proposed this year to stage the handicap race for the Siddeley Trophy, presented by Lord Kenilworth, on Saturday, October 16th, under the joint organization of the Royal Aero Club and the Wolverhampton Aero Club. It will be remembered that the race is open to club members flying club aircraft or private owners in their own aircraft, all professionals being expressly debarred. The race will be over a three-lap course of approximately 64 miles, and it is anticipated that heats will have to be flown before the main race. The first prize is £50 and the Siddeley Trophy; the second £25 plus a memento; and the third £10 plus a memento. A £5 prize is also to be offered for heat winners. The mementoes and heat prizes will be presented by the Wolverhampton Club in addition to approximately half the main prize money. As soon as they are received from the printers, entry forms and regulations will be posted to all clubs within the A.B.A.C. organization, and other enquiries should be made to the secretary of the Wolverhampton Club. Should the weather on Saturday, October 16th, be unsuitable for the contest plans have been made to hold it on the following day.

GAS TURBINE PROSPECTS

THE Director of the National Gas Turbine Establishment, Mr. Hayne Constant, F.R.Ae.S., M.I.Mech.E., in a recent interview with the Press, said that his team at Pyestock are probably the world's leading specialists on axial compressor design. On the subject of fuels, he then gave it as his opinion that in time it would be possible to use the heaviest and crudest of fuels, and suggested that coal did not necessarily need to be pulverized before rendering it usable in a gas turbine; in addition, ordinary producer gas should be added to the list of possible fuels.

Mr. Constant also went on to advise that there was no need to worry very much about the present shortage of liquid fuel. By the time the gas turbine appeared in large numbers, one could expect that the whole outlook on liquid fuel supplies would have changed. He did not, however, indicate in what direction this changed outlook might be expected, other than forecasting that a fuel saving of at least 20 per cent could be expected in the consumption figures of engines turned out in the next year or two. Additionally, when the present "cooled" turbine came to fruition, a very big improvement in all-round performance could be expected. It is, of course, the temperature at which turbines can satisfactorily operate which sets the limit to the power delivered, and if a turbine can be cooled with any degree of success, then the peak temperature at the blades can be allowed comparatively to increase in order to give a greater expansion ratio.

On the industrial side of application, Mr. Constant averred that the general employment of the gas turbine to land and sea purposes was likely to take much longer than in the aeronautical field, because the rate of progress was much slower and existing capital equipment would have to work out its natural life before replacement. However, the Director foresaw that when atomic energy power stations were developed, we might expect the heat generated in the atomic pile to be converted into power in a gas turbine very similar to those we knew to-day. He also suggested that we might see the day when a firm will make gas-turbine components and assemble them to order in whatever system is required by their customers, in much the same way as radio firms manufacture components and assemble them at the present time.

FORTHCOMING EVENTS

Sept. 25th.—S.L.A.E. (South Eastern Area): "Aviation Gasolines," by G. L. Coles, B.Sc., A.R.C.Sc., F.Inst.Pet., Manson House, 26, Portland Place, London, W.1, at 3 p.m.

Sept. 25th and 26th.—Butlin's Week-end Air Rally at Ingoldmells, Skegness.

Sept. 25th and 26th.—International air rally at Cervin, Sion, Switzerland.

Sept. 27th to Oct. 1st.—Fédération Aéronautique Internationale Conference, Paris.

Sept. 28th.—R.Ae.S. (Graduates and Students): "Sailplane Design," K. G. Wilkinson, B.Sc., A.C.G.I., D.I.C., A.F.R.Ae.S.

Sept. 28th.—R.Ae.S. (Glasgow): Film Evening, Prestwick airport.

Sept. 30th.—Royal Aeronautical Society: Fourth British Commonwealth and Empire Lecture: "Some Economic Factors in Civil Aviation, with Emphasis on Civil Aircraft and their Prospective Trends of Development." Peter G. Masefield, M.A., F.R.Ae.S.

Oct. 6th.—Royal Aeronautical Society (at Birmingham): "Some Aspects of Power Plant Development," Dr. E. W. Still, B.Sc., A.F.R.Ae.S.

Oct. 9th.—The British Interplanetary Society: "Interplanetary Man," Olaf Stapledon.

Oct. 13th.—R.Ae.S. (Hatfield) "Aircraft Photography," John Yoxall.

Oct. 15th.—Second International Air Ball at London Airport.

Oct. 21st.—Royal Aeronautical Society: "Cold Weather Operation of Aircraft," G. W. Wilson, A.F.R.Ae.S. and S/L. E. P. Bridgland, R.C.A.F., B.Sc., A.F.R.Ae.S.

Oct. 26th.—R.Ae.S. (Graduates and Students): "Flight Refuelling," Sir Alan J. Cobham, K.B.E., Hon F.R.Ae.S.

Oct. 30th.—S.L.A.E. (South Eastern Area): "High Speed Flight," by W. A. Waterton, Manson House, 26, Portland Place, London, W.1, at 3 p.m.

Nov. 10th.—R.Ae.S. (Graduates and Students): "Flying Experiences," Lt. Cdr. (A) E. M. Brown, O.B.E., D.S.C., A.F.C., M.A., A.R.Ae.S., R.N.

Nov. 12th.—Redditch Society: "Aircraft Photography." John Yoxall.

Nov. 17th.—R.Ae.S. (Hatfield): "Design Problems of Large Flying Boats," H. Knowler, F.R.Ae.S.

Nov. 20th.—Joint Meeting Royal Aeronautical Society and Helicopter Association of Gt. Britain. Full day Discussion on Helicopters.

Nov. 27th.—S.L.A.E. (South Eastern Area): "Gas Turbine Power Plants," by D. H. Mallinson, B.Sc., Manson House, 26, Portland Place, London, W.1, at 3 p.m.

Dec. 21st.—R.Ae.S. (Graduates and Students): "Production—The Dynamics of People at Work." J. V. Connolly, B.E., A.F.R.Ae.S.

Feb. 14th.—The Institute of Transport: Brancker Memorial Lecture by Major R. H. Mayo, O.B.E., M.Inst.T.

FROM ALL QUARTERS

CONVERSION TABLES

FROM the Rolls-Royce company has been received a new pocket book of conversion tables arranged in a particularly neat and compact manner. Many people in the industry will recognize the influence of Mr. M. Procter-Gregg, Rolls-Royce publicity manager, in the production of this booklet, and will remember his earlier tables, printed some 16 years ago. The three-column system is employed in which the units are placed separately, and the appropriate conversion is read off directly on one or other side of it. The tables are preceded by general information arranged alphabetically under such headings as area, energy, speed and thrust.

TESTING BRABAZON LANDING-GEAR

TESTS of the Bristol Brabazon undercarriage conducted in the large rig specially built for the purpose by Dowty Equipment, Ltd., are described in the October issue of *Aircraft Production*, appearing next week-end. The article is by Mr. A. E. Bingham, M.I.Mech.E., F.R.Ae.S., M.J.I.E., Dowty's Chief Test Engineer.

A steel-girder structure 33ft in height carries a vertical post which, mounted at the ends of two radius-arms, has a parallelogram action which allows it to be dropped vertically, with only a slight horizontal displacement. The post, to the base of which the undercarriage is attached, can be loaded to simulate a falling mass of some 50 tons weight; it is raised by a hydraulic jack and released by a hydraulic lock.

In order to represent drag conditions, the wheel is dropped on to concrete wedges. Electronic and other equipment is used to record results.

A series of some 200 test-drops, apart from retraction tests, is nearing completion.

FLIGHT AT HIGH MACH NUMBERS

SINCE John Derry in the D.H.108 exceeded the speed of sound the import of flight at transonic and supersonic speeds has occupied the thoughts of many people who previously had accepted such facts as they were offered, but had not otherwise given the subject further consideration. In connection with this historic research flight and in answer to the question "Why is the speed of sound significant?" a clear and concise explanation from the de Havilland company, couched in everyday terms may be welcomed by some of our less technical readers:

A sound wave is a pressure wave in air, and is propagated at a speed dependent only on temperature. The air's temperature drops with altitude, and therefore the speed of sound decreases from about 760 m.p.h. at sea level to about 660 m.p.h. at 36,000 feet and above.

The flow of air over an aircraft flying at speeds regarded until recently as "normal"—(up to a Mach number of about 0.7)—follows rules not dissimilar from those obeyed by water around the hull of a ship. But air, unlike water, is a compressible fluid, and as the speed is raised (beyond about M = 0.7) this compressibility becomes increasingly significant. At the speed of sound (M = 1.0) and above, the pressure waves produced by the passage of the aircraft cannot travel ahead to prepare the air for deflection around the approaching body since their speed is no greater than that of the body itself. In consequence, the aircraft meets the air without any warning, deflecting it with a sudden shock effect. At these speeds, therefore, the flow over the aircraft follows laws different from those governing the effectively incompressible flow which is found at lower speeds and Mach numbers. It is in the transonic region, i.e., M = 0.9 to 1.1, that these phenomena present the greatest problems to the designer.

Air, to pass round an aircraft, must accelerate over parts of the surface to speeds above that of the aircraft itself. It therefore follows that at true aircraft speeds below that of sound local flow may reach or exceed a Mach number of 1.0. It is these areas of supersonic flow which produce localized pressure changes having effects on the behaviour of the aircraft which are often unpredictable, because one set of laws is breaking down and another set is establishing itself, producing inconsistencies of behaviour about which little is yet known.

Technical effort to-day is therefore directed towards the evolution of aircraft having satisfactory characteristics at low speed and yet able to reach higher and higher Mach numbers without encountering unacceptable control difficulties or structural stresses resulting from these local disturbances. In the supersonic region (Mach numbers over about 1.1) the airflow tends to stabilize once more in a new pattern, which enables the designer to predict the behaviour of an aircraft with a degree of certainty which he is at present denied in the transonic zone.

R.A.F.V.R. GROUND TRADES

RECRUITING is to begin on October 1st, for the first time since 1939, for ground trades in the R.A.F.V.R., and also for the newly founded W.A.A.F./V.R.; 17,000 men and women volunteers are required. Only former members of the R.A.F. and W.A.A.F. will be accepted at first, though it is expected that this provision will later be dropped. For continuous training periods over 48 hours full service rates of pay will be allowed, as well as tax-free bounties of £9 per year for men and £6 for women. Additional supplementary bounties of £3 for men and £2 for women will be paid for extra voluntary training.

FORMER FIGHTER A.O.C.'s REPORT

A REPORT on the Air Operations of Fighter Command between November 25th, 1940, and December 31st, 1941, by Marshal of the R.A.F. Lord Douglas of Kirtleside, the A.O.C. over that period, was published last week. The difficulties encountered by our night fighter squadrons in countering the German night raiders, and the successful methods of interception adopted are described in detail. Lord Douglas tells how radar-installed night fighters, working with the system known as ground control interception, proved to be the answer to the bombers in March, 1941, when night fighters destroyed 22 of the total of 43. A few weeks later the raids died down, after failing to achieve any strategic purpose. This, said Lord Douglas, was in a sense a disappointment, as it was felt that an enemy over whom we were gaining mastery had slipped out of our grasp.

The relaxing of the German effort gave us the chance of seizing air initiative in Western Europe. The ensuing offensive fighter sweeps and bombing attacks were known as "Operation Circus." Although the original aim of this operation was to force the enemy into battle, in July, 1941, the object became the destruction of important enemy targets. Fighter Command's commitments in those days were heavy, as it was also charged with protection of shipping. It is interesting to note the unusual methods of defence that were tried during this crucial period, including the flying of barrage balloons carrying lethal charges, the trailing and sowing of aerial mines in the path of bombers, and the trial installation of searchlights in night fighters. Such experiments were in keeping with the enterprising spirit shown by the R.A.F. throughout the war. The present air defence of Britain derived much from successful systems evolved during the period reviewed by Lord Douglas.

LINCOLNS OVER LONDON

(*Continued from page 366*)

through its smoke before turning starboard just past Chipping Warden, on course for Bedford.

The navigator was now partially buried under his Gee blackout. The Skipper called C "Charlie" and D "Dog," the other Lincolns of our squadron, who were sticking close by us as we drove into the gloom, that we were nearing Northampton, adding later that we were descending to 800ft and going over to a new R/T channel. C "Charlie" opened his bomb-bay doors to lose speed—the effectiveness of which measure was questioned by our Skipper. Wyton Tower failed to reply even on our second asking, and someone's transmitter was announced as having gone for a Burton (though the word was not Burton). At last, ten miles from base, we got through to base the information that we—"a formation of three aircraft"—were approaching from the south-west at 800ft, still descending. Our navigation lights were turned on and there ensued one of those interesting periods in which quiet prevails and eyes are strained. Finally we saw the "funnel" of sodiums leading to the runway, and after skimming over St. Ives, the Skipper, having been given permission to land, called "Wheels down. 2,850, flaps thirty," then "Gladly Baker turning final," and at length, as we saw the wet runway looming up, "Full flap." As we rolled to a stop and the flight engineer announced "Flaps up, pitot head off," the clock showed 1850 hours.

We left the warmth of "Gladly Charlie," through the wet and cold of the airfield for the comfort of the mess, to learn that two of our Lincolns, with some airsickness cases among the supernumeraries had been diverted to Lyneham. The ceiling was 250 feet.

H. F. K.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE FAIREY GYRODYNE

Answer to a Query

I AM glad to be able to reply in the affirmative to the question raised by Mr. Huggett, of Clifton, in your issue of August 12th, 1948, as to whether or not the Fairey Gyrodyne is officially recognized as a helicopter.

The word "Helicopter" is defined by the British Standards Institution as a rotorcraft with power-driven rotor(s) rotating on substantially vertical axes. A similar definition is accepted by the F.A.I. The Gyrodyne not only comes within this definition but holds the F.A.I. speed record for helicopters.

As to the other point which is, in essence, an idea of having two stub-wing airscrews as against the one of the Gyrodyne, the following explanation may be useful.

A single-rotor helicopter is already asymmetric in regard to torque balance, and the single propulsive airscrew, mounted outboard on one side only of the aircraft, merely balances one asymmetry by an equal and opposite asymmetry. The torque balance problem, therefore, would not be affected by the addition of a second airscrew mounted outboard on the other side of the aircraft, as this would have to provide in hovering flight a backward thrust which is already provided by a backward inclination of the main rotor axis.

B. J. HURREN,
Sales Development Manager,
The Fairey Aviation Group of Companies.

THE S.B.A.C. DISPLAY

Praise for the Organization

The following letter has been sent to the organizers of the S.B.A.C. Display at Farnborough and a copy of it to us:—

AS a very ordinary member of the general public, who likes to give praise where praise is due, I would like to thank you for a truly memorable day at Farnborough on Saturday last.

I came away after the display with three outstanding impressions:—

First, the excellence of the organization, obviously the result of much intelligent and thoughtful planning. To the back-room boys responsible, a very hearty thank you. Everything was perfect—including the gentleman who spoke over the loud-speaker system before flying began, and who was promptly nicknamed "Pompous Percy" by my section of the crowd. His "Thank you . . . for clearing . . . the runway . . . expeditiously" was absolutely delicious, and we all roared. I would also like to congratulate those responsible for organizing transport facilities. I travelled from London, and we were positively *whisked* to the airfield by way of special train from Waterloo and bus from Aldershot—no delays whatsoever—and the same applies to the return journey. Adequate and well-organized transport helps so much in one's enjoyment of these functions, and I am writing to the Southern Region of British Railways and to the Aldershot and District bus people to express my appreciation of their very successful efforts.

Secondly, the display gave my self-respect as a Britisher a much-needed boost. No nation which can build planes like those we saw on Saturday, and produce the men to fly them as they were flown, is in danger of becoming a second-rate power. It was a truly inspiring occasion, and I only wish everyone in the country could have been there—it would have given the "Britain is finished" types something to think about.

Which brings me to my third point—the cheerfulness, good humour and essential *decency* of the very large crowd at Farnborough. I think one tends these days to visualize the "man in the street" as someone concerned only with securing more pay for less work, completing football pool coupons, and attending greyhound and speedway tracks. So it was very agreeable to meet such large numbers of good-humoured, intelligent, *healthy-minded* folk, of all ages and classes. They and their like—not the politicians and the spivs and the strikers—are, after all, the backbone of Britain. Thank God there are still plenty of them.

In conclusion, thank you, again, gentlemen, for a very happy and inspiring day. I, for one, will not forget it, and I shall be looking forward with pleasurable anticipation to next year's display.

P. LAFFY.

London, N.W.8.

MAKING IT DIFFICULT

Air Visitors Experience Delays, Deposits and Duplication

I HAVE heard of several instances during the last few months of foreign visitors flying to this country in their own aircraft and meeting with all kinds of difficulty and awkwardness—though not discourtesy so far as I know—from the authorities. In particular, it seems that large sums of money are demanded as deposits to allow the aircraft to enter the country, and matters settled at one airfield are all gone over again when the aircraft flies on and lands at another airfield; and, finally, that long delays are occasioned unnecessarily.

My own experience, at home and on the Continent, has been that everyone is helpful, although over here we seem to need at least twice as many forms and signatures. However, I have always been flying a British aircraft in or out.

Apart from wishing to be as helpful and hospitable as possible, it is worth considering that if we here place obstacles in the way of private or business visitors from abroad it will not be long before they talk of their experiences at home and we meet with the same treatment. This must obviously be avoided. If it is necessary to keep in force the various restrictions which cause the trouble, at least let us make sure that the visitors by air know what to expect before they take off, and then they will come prepared, or decide not to come at all, as the case may be.

In conclusion, I quote as an example one pilot's experiences which have already been printed at length in America. Some pretty pointed comments on difficulties, delays and waste of effort were made in the magazine *Air Facts* by this American traveller, Mr. James Herrick, on his way from America to Sumatra earlier in the year. Some of his remarks seemed to be a bit childish and exaggerated, but others are worth noting and bear out the opinions about treatment meted out more recently to other air visitors.

After landing at Prestwick airport Mr. Herrick declared that the quantity of forms and paper work to be completed was by far the worst that he encountered throughout the entire journey.

One of his principal difficulties was to assure the British authorities, by means of £2,500 deposit, that he would not sell his £2,000 aircraft during his passage through the U.K. He points out that had he done so it would have been impossible to convert the proceeds of the sale into dollars, and, moreover, in any event, the purchaser would have had to register the aircraft in this country, in which case the Customs duties could have been collected. Notwithstanding all efforts to prove that he was in transit to the Netherlands East Indies, Mr. Herrick found further progress barred until he had obtained a surety in the sum required, which was put up by the Vacuum Oil Company's representative in London.

He was also involved in a "learned discussion" between two officials as to whether or not a form S.107 was required in the circumstances. After the loss of another hour the form was duly completed and the point settled. The terrific burden of our "overblown paper system" was criticized as a "phobia involving a terrible and horrible waste of effort."

Quoted as an illustration of the waste of manpower is an incident which occurred when putting his aircraft away in a hangar for the night; about 15 men assisted in pushing the aircraft from the tarmac into the hanger, and in response to his enquiries, Mr. Herrick was astonished to learn that pushing aircraft about was the sole occupation of these persons, all of whom wore M.C.A. flashes on their shoulders. Further questioning revealed that on an average they pushed four or five aircraft a day in and out of hangars—that and nothing more.

After enquiring at Croydon (about the briefing room of which he remarks: "The control room of the 8th Army Air Force was not much bigger") as to the location of petrol supplies, Mr. Herrick was escorted thither by no fewer than seven M.C.A. employees. "All of the boys," he says, "were as nice personally as you could find anywhere in the world; but I couldn't help but groan for the poor taxpayers of Britain (and America, too) who were being asked to carry this burden."

F SNECKITT.

London, S.E.4.

SERVICE AVIATION

"Flight" photograph.

Two Meteor 4s make a study in speed as they leave Horsham St. Faith on the first leg of the Denmark trip referred to on this page.

R.A.F. Receives the Public

THE R.A.F.'s "Open Day," a now customary feature of the Battle of Britain celebrations, was held last Saturday, when more than 550,000 members of the public were received as guests at 82 R.A.F. stations. On Air Council instructions, a particular effort was made this year to give the public the clearest possible view of Service activities and conditions. Good use was made of the opportunities presented for recruiting. The number and variety of aircraft taking part in the large total of flying displays must rarely, if ever, have been exceeded on any previous occasion, and it is unfortunate that such an achievement should have been marred by the four regrettable flying accidents which occurred. *Flight* extends sympathy to the relatives of the ten civilians and seven members of the R.A.F. who were killed.

Aerobatics by Meteors and Vampires, aided by the excellent weather, were prominent events in many of the displays, not only at the fighter bases, but at many units where jet fighters are still a rarity. Small formations of visiting F-80 Shooting Stars of the U.S.A.F. demonstrated with no mean skill at stations in the south, and two formations—six Lincolns and six Lancasters—put in appearances on behalf of Bomber Command at a widely-scattered selection of stations. The Secretary of State for Air, Mr. Arthur Henderson, visited Thorney Island, where after "scrambling" the three resident Meteor Squadrons, and watching part of the display, he took off for Booker to see Bomber Command's "At Home." A flying tour by the Chief of Air Staff, Lord Tedder, enabled him to visit Odiham, Upwood, Bassingbourn and Manston, and similar flights were made by Air Officers Commanding.

Meteors Fly North

THE visit to Denmark by eight Gloster Meteor 4s (two Rolls-Royce Derwent 5s) was announced in the preceding issue. Last Thursday morning, *Flight* arrived at their Horsham St. Faith base as two Halifaxes, carrying ground staff, departed, but in good time to wish success to G/C D. G. Lewis, D.F.C., who commands the flight. The other pilots were W/C. J. H. Lapsley, O.B.E., D.F.C.; S/L. E. W. Wootten, D.F.C. and Bar; F/L. R. E. Windle; F/L. E. M. Higson; F/L. H. A. Groves; F/O. K. C. Nixon, Pilot 1 D. C. Todd; Capt. A. J. Tucker, U.S.A.F. The reserves were Pilot 2 T. M. Hamer; Pilot 3 A. Burns.

"Met." promised good weather, with an anticyclone moving in off the Atlantic. The first leg of the trip was to Eindhoven in Holland, the second to Lubeck, Germany, and the third to Copenhagen. Flying times respectively should have been about 30 min, 43 min, and 15-20 min. W/C. Lapsley said that after leaving Horsham St. Faith he would climb, at 12,500 r.p.m., to 10,000 feet. The Meteors would fly in two battle formations and would close up into two boxes when approaching Eindhoven. A Lancaster with an airborne lifeboat was to stand by at Manston. One of the Wing Commander's final instructions was that immediately after take-off pilots should see that their belly drop tanks were on, and that the fuel level did not drop below 100 gallons in each fuselage tank.

Royal Air Force and Naval Aviation News and Announcements

Fraternal Greeting

GENERAL HOYT VANDENBERG, Chief of Staff of the U.S.A.F., last week sent the following message to Marshal of the R.A.F. Lord Tedder:

"On this eighth anniversary of the Battle of Britain the United States Air Force takes pride in joining the Royal Air Force in honouring the heroic men and women whose steadfast courage and

"Flight" photograph.

G C. D. G. Lewis (fourth from left), and other pilots taking part in the flight to Denmark.

Service Aviation . . . . .

strength of purpose enabled them to triumph over the forces of totalitarianism. The ties of friendship between our Air Forces, forged in war and maintained in peace, are a source of never-ending personal pleasure to me and to every member of the United States Air Forces."

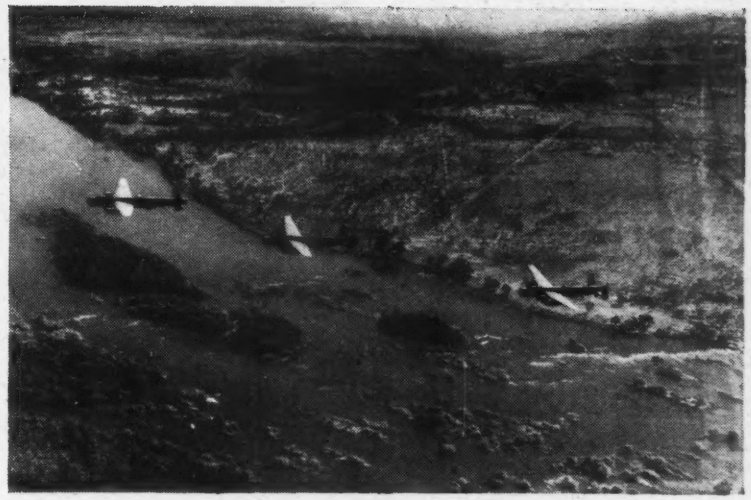
Lord Tedder's Reply:

"On behalf of all ranks of the Royal Air Force I thank you and the United States Air Force for its kind message on the anniversary of the Battle of Britain. It gives us all very real pleasure to have units of the United States Air Force with us at this time, for we are intensely proud of the close comradeship and unity of purpose which exists between our two Air Forces, and it is our earnest hope that this comradeship will flourish for all time and will serve as a pattern for mutual respect and good fellowship among all Air Forces in the world."

Aircrew Age Limit Extended

THE Air Ministry has announced that ex-R.A.F. aircrew and others with flying experience are offered special conditions of return or entry to the R.A.F. for eight-year periods. For experienced pilots and navigators (whether ex-R.A.F. or not) who can begin flying at once, the upper age limit is raised to 30, and for signallers, engineers and gunners, to 34. Those who lack experience or have not flown for some considerable time and those who have completed or nearly completed their training but have never flown productively may be given accelerated training; this will depend on the vacancies in the training organization and their own suitability. These volunteers must normally be under 25 but suitable ones will be considered if older. Those who do not fit into any of these classes but who have had some flying experience (for example five hours solo as a pilot or 50 hours in any other aircrew capacity) can volunteer up to the age of 25 on their next birthday.

Ex-R.A.F. pilot and navigator officers may be offered short service commissions of eight years with rank based on previous service. All other pilot and navigator candidates who are up to officer standard will be guaranteed commissions subject to completing officer training and any flying training necessary. Ex-airmen aircrew pilots and navigators who are not given a commission on return to productive flying will be offered their old aircrew rank. Like other candidates under the scheme they may qualify for a commission later. In other aircrew cases, rank will depend on the stage at which they enter into training. Ex-officer signallers, engineers and gunners will not be granted commissions but will be offered a specific aircrew rank and seniority based on their previous service.



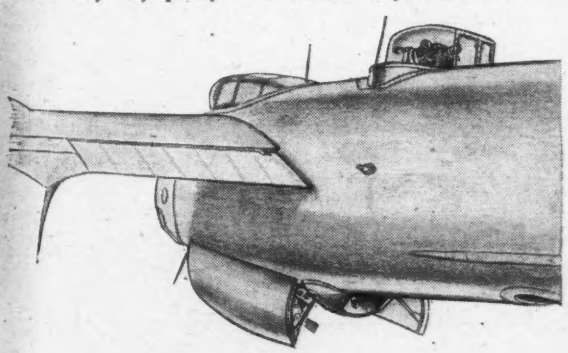
OVER THE ZAMBESI: These three Lincolns of No. 44 (Rhodesia) Sqn., Bomber Command, photographed during the Squadron's recent training flight to Southern Rhodesia, appear almost insignificant against the grandeur of the landscape below.

War-load Variety

HAWKER'S carrier-borne fighter, the Sea Fury 11, is remarkably versatile in choice of external loading. It is equipped to carry twelve rocket projectiles with 60-lb heads or two 100/1,000 lb bombs, two clusters of small anti-personnel bombs, two light series carriers with 8½ lb practice bombs, two photoflash bombs, two smoke curtain installations, or, finally, two flare, camera or "window" (anti-radar) containers. Its four permanent wing-mounted Mk V Hispano guns are supplied with 580 rounds of ammunition. For reconnaissance duties the Sea Fury 11 may carry two F.24 cameras in the fuselage—one oblique and one vertical.

Mosquito T.T. 39

THE conversion for target-towing duties of the D.H. Mosquito B.16 to Air Ministry Specification Q.19/45 was achieved with considerable ingenuity by General Aircraft, Ltd. The large glazed nose of the finished product, the Mosquito T.T.39, contains a camera and operator for recording A.A. fire, and there is a dorsal cupola for an observer who, facing rearward, is responsible for drogue operation. A hydraulically operated winch in the bomb-bay is used for drogue-towing. A retractable wind-driven generator powers the winch. Some details of the aircraft are shown in the sketch on this page.



Items of interest shown in this "Flight" sketch of the Mosquito T.T.39 include the observer's turret, the windmill and drogue chute in the open bomb bay, and the aft entry hatch.

"My Aircraft"—Put Into Practice

THE excellent pre-war R.A.F. custom of allotting responsibility for the smart appearance of an aircraft to specific flying and ground crews was revived, and gave good results, during No. 44 (Rhodesia) Squadron's training exercise flight to Southern Rhodesia. During the visit the high standard of the Squadron's Lincolns was frequently commented upon, as was the bearing and behaviour of all ranks, receiving praise from the Prime Minister, Sir Godfrey Huggins. The Squadron Commander, reporting on the exercise, said that the system resulted in improved morale and *esprit de corps* between air and ground crews, who were willing to work late hours in their own time to keep their aircraft serviceable and smart. A photograph of squadron aircraft taken during the tour appears above.

Navy also Introduces New Aircrew Scheme

THE Admiralty has announced new terms of engagement for Naval pilots and observers, drafted on similar lines to the scheme now operated by the R.A.F. Pilots and observers are to be commissioned on successful completion of training and will serve for eight years, followed by seven years on the reserve. As in the R.A.F. there will be opportunities of transfer to permanent commissions.

The entry of rating pilots is to be dropped, and arrangements are being considered for the award of commissions to selected serving rating pilots. Some officers of the air branch now serving

Service Aviation . . . . .

on extended service commissions will be offered permanent commissions or further extended service under the new arrangements.

Coastal Command in Fleet Exercise

AIRCRAFT of Nos. 18 and 19 Groups, Coastal Command, some Bomber Command Lancasters, and shore-based Naval aircraft will operate for Blue Force in the Home Fleet Exercise between September 23rd and 25th. Commander of the aircraft force will be A.V.-M. F. L. Hopps, A.O.C. 19 Group. The Coastal Command aircraft's role will be to locate and shadow the Red Force fleet in the English Channel and South-West approaches, homing on to the fleet attacking bombers and Naval aircraft and also assisting Blue Force surface vessels in their attacks.

Polar Flight Awards

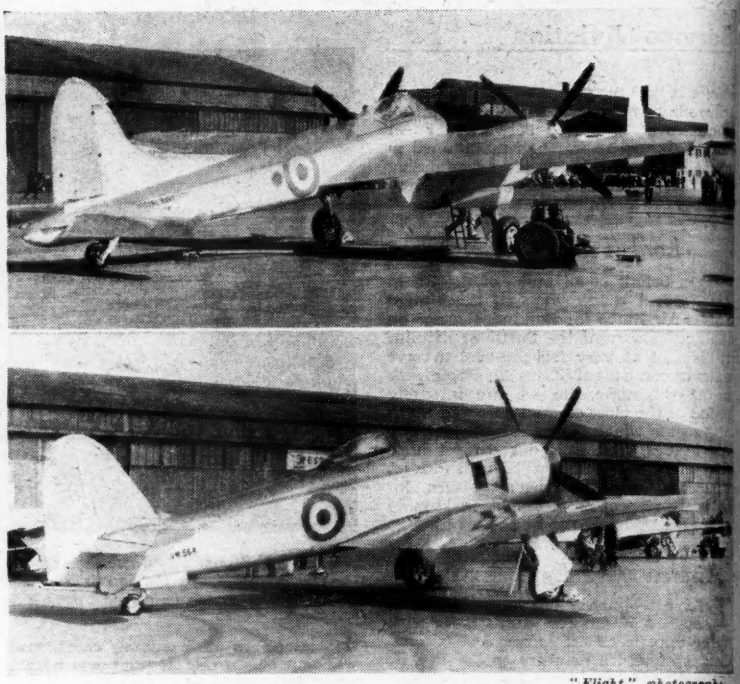
AWARDS were recently announced for crew-members of the R.C.A.F. Canso flying-boat which last year flew into unchartered northern areas to obtain data on the location of the Magnetic Pole. The Air Force Cross has been awarded to F/L. J. F. Drake, pilot, and F/O. J. E. Goldsmith, navigator of the aircraft; F/O. Allen, co-pilot, F/O. McCoy, wireless operator, and Sgt. Millinan, crew chief, have all received the King's Commendation for valuable service in the air.

Malcolm Club at Yatesbury

ON Friday, September 10th, Mr. Verdon Smith opened the Bristol Malcolm Club at Yatesbury, Wilts, for the use of airmen at the R.A.F. stations of Yatesbury and Compton Bassett. The premises, formerly belonging to the Bristol Flying School, are a generous gift to the Malcolm Clubs organization from the Bristol Aeroplane Company, of which Mr. Verdon Smith is a director. The many thousands of airmen who have been trained in this isolated district can testify to the fine lead set by the company in making such a club possible, the first of its kind in this country. Mr. Smith said in his opening speech that the company had handed over Yatesbury very cheerfully and gladly, because they thought it was something really worth doing. He represented all his colleagues in wishing good luck to the Bristol Malcolm Club at Yatesbury.

A. Cdre. Seward, A.O.C.H.Q., No. 27 Group, in replying, read first a message from Lord Tedder, the Chief of Air Staff, who is President of the Malcolm Clubs, thanking the Bristol Company, and Mr. Verdon Smith, for making the club possible. The Air Commodore went on to say that in commanding Compton Bassett and Yatesbury he realized how much airmen were tied to their camps, and urged them to get away from the environment of their huts to the bright and pleasant atmosphere of the club.

Although the Malcolm Clubs' long-term plan for Yatesbury is held up, the present club is now most attractive, with a first-class comfortable bar-lounge, a pleasant dining-room, and a shop containing a wide variety of goods. Sports facilities comprise an extensive indoor games-room, hard tennis court, and a squash court. Though chiefly intended for airmen serving at Compton Bassett or Yatesbury, it is hoped that in time airmen from farther afield will make use of the club. A committee formed of equal numbers of airmen from the two nearby stations was set up immediately after the club opened, so that it will develop according to the men's own ideas.



"*Flight*" photographs

TRIM CRAFT: Comparative views of our latest—and probably last—Naval piston-engined fighters: the de Havilland Sea Hornet (2 Merlin) and Hawker Sea Fury (Centaurus). Both are finished in the latest Naval colour scheme, with grey upper works and so-called duck-egg blue on vertical and bottom surfaces. The plate behind the Sea Fury's exhaust stubs is unpainted, but is quickly coloured by heat.

New Suits for Firefighters

A NEW duty uniform is shortly to be issued to R.A.F. crash fire fighters, consisting of a blouse and trousers in battle dress style, with a zip fastener to the blouse. This protective suit is made of a closely woven woollen material with excellent heat-resisting qualities, and is not unduly heavy; it is convenient wear in which to move around the inside of a damaged aircraft, as there are no loose ends or external fitments. A moulded fibre helmet similar to those worn by miners, with a Perspex vizor to protect the face, will also be brought out. The suit and helmet will be tested at selected stations at home and abroad, in case any modifications are necessary, before general issue.

Permanent Commissions

THE following officers have been selected for permanent commissions in the R.A.F. in the branches shown:—

TECHNICAL BRANCH

Squadron Leaders: A. G. Clennet, M.B.E., D. J. C. Frost, P. S. Hall, R. A. Harding, F. A. Harris, E. Hearl, T. Hughes, S. J. Meagor, S. F. Mitchell, M.B.E., J. T. Morris, H. A. Paton, G. A. Pearson, M.V.O., C. W. Sheppard, H. P. Shippobotham, A.F.M., J. H. Simpson, F. J. Walters, M.B.E., C. T. White, M.B.E., A. G. Woods.

Flight Lieutenants: E. W. S. Austin, J. P. Balfour, D.F.C., T. H. Charlton-Brown, R. Christie, G. H. Coveney, G. T. Dale, D. W. E. Davies, J. B. Evans, J. Gillespie, A. V. J. Hicks, D. B. Hilliditch, D. J. Hughes, E. A. Ingrovill, M.B.E., H. W. Jarrett, P. L. Kelly, B.E.M., W. R. J. Marriott, A. J. Peart, B. Ravenhill, J. H. Smith, D. T. Stanley, C. J. Turner, W. H. Wilcock, T. S. Wilkinson, D. C. Williams.

Flying Officer: H. A. Peters.

EQUIPMENT BRANCH

Squadron Leaders: E. G. B. Hughes, C. R. J. Leggott, M. McLeod, W. M. Nowell, J. H. Sanderson, H. L. Tyne.

Flight Lieutenants: E. C. Stoke, B.E.M., R. Watt.

Flying Officers: J. F. Baker, F. Binns, J. R. Duncan, E. K. Etherridge, J. A. Foster, K. J. Luton, A. E. Mackay, B.E.M., J. J. Roddy.

CATERING BRANCH

Flight Lieutenant: T. M. Potter.

CHAPLAIN'S BRANCH

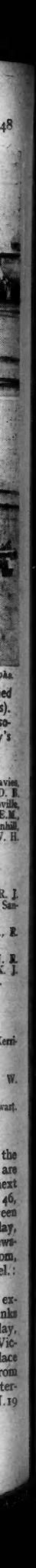
Rev. P. W. Hearn (Methodist), Rev. J. Kerrigan, M.A. (Baptist).

R.A.F. REGIMENT

Flight Lieutenants: A. J. Archibald, A. W. Eekhout.

Flying Officers: G. A. Bennett, A. A. Stewart.

Reunions

ALL ranks who served in the Rhodesian Air Training Group are invited to the "RATgroupers'" next informal party at the "Rising Sun," 46, Tottenham Court Road, W.1, between 6.30 and 10.30 p.m. on Wednesday, October 20th. Details and latest newsletters from Hon. Sec., B. Ramsbottom, 2, St. Cuthbert's Road, N.W.2 (Tel.: Gladstone 2527).

The Annual Re-union dinner of ex-members of No. 3 G.T.S. (all ranks R.A.F.) will be held on Saturday, November 20, at 6.30 p.m. at The Victoria Hotel, 56, Buckingham Palace Road, London. Tickets 10s each from Secretary, G. A. T. Burdett, 5, Waterlow Road, Highgate Hill, London, N.19 (Tel. Archway 2340).